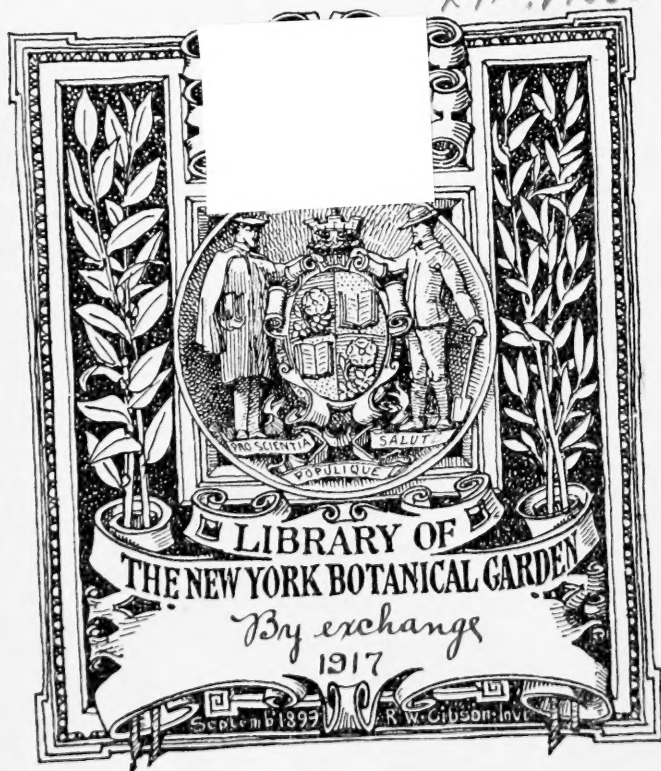


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DIVISION OF FORESTRY.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haught, Forest Nurseryman, Box 207, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications
**SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207,
HONOLULU, HAWAII.**

EDW. M. EHRHORN,
Superintendent.

THE HAWAIIAN FORESTER AGRICULTURIST

VOL. XI.

JANUARY, 1914.

No. 1

Locusts continue to give the agricultural authorities of the Philippines great concern. Lately the territorial legislature passed an appropriation of \$100,000 to fight the pest, voting down various amendments for smaller amounts.

Bottles and broken glass thrown carelessly away have been proved one cause of forest fires on the mainland, as they concentrate the rays of the sun upon dry stuff. An inspector in the northwest, searching for the cause of an incipient blaze among dead leaves, which he stamped out, discovered the bottom of a beer bottle lying on the leaves upon which the sun was playing its rays.

Some weighty pineapples grown on Ceylon estates, the Kew variety being mentioned, are told about in the Tropical Agriculturist. Four, from as many different growers, have their weights given as 16, 20, 21 and 24½ pounds.

An article advocating increased growing of corn in Hawaii, with regard to the local market for both breadstuffs and animal feed, is reprinted in this number. Its author, Doctor Wilcox, has also lately produced articles advocating the standardizing of Hawaiian coffee for the outside market, arguing the profitableness of the coconut industry for Hawaii and presenting the adaptability of algaroba beans for human food material—both toothsome edibles and a substitute for coffee devoid of caffeine being capable of derivation from algaroba bean meal. A local man, it is stated, has patented a process for producing the coffee substitute, an article that should be welcome to the dietary of those with whom the real thing disagrees.

A forest note from the national agricultural department says "it has been suggested that guayacan, a very hard wood of Central America, may furnish shuttle blocks to supplement dogwood and persimmon, now much used and in danger of exhaustion." Perhaps manufacturers of the article mentioned would find just what they require in some of the hard woods of Hawaii. For instance, some of the waste wood of the Hawaiian Hardwood Company's mill might be found to suit the purpose.

With its annual report for 1913 the Massachusetts Forestry Association sent the Forester its Christmas greetings neatly printed on a slip of paper grained to resemble heart of beech. The report contains a list of 3382 members of the association, including life and contributing, besides 28 clubs holding membership in it.

In the latest Official Ayreshire Record, issued at Brandon, Vermont, is presented the "world's champion Ayreshire cow." This is "Auchenbrain Brown Kate 4th, 27,943 A. R. 547," owned by Penshurst Farm, Narberth, Pa. "She gave during the year," says the Record, "10,820 quarts of milk, at a cost of less than one and three-fourths of a cent a quart, which was sold at five cents a quart, making an income from her milk above cost of food consumed of \$541. She was selected and purchased in Scotland by Mr. Percival Roberts, Jr. She is a very attractive looking cow, weighing about fourteen hundred pounds." Some cow, truly. With milk at 12 cents a quart, "Kate" would be a gold mine in Honolulu. People would wish even to sell "Mountain King" stock to get an interest in her.

INDEX TO VOLUME X.

With this number is presented the table of contents, with analytic index, of Volume X, covering the calendar year 1913, of the Hawaiian Forester and Agriculturist. It has been compiled on the same plan as the indexes for several previous volumes. Both contents and index are arranged alphabetically, in the index the official reports, important articles and some classified data being sub-indexed by alphabet. This system avoids the confusion that would result from mingling the minutia of minor details with the major subject matter of the volume. It may appear that excessive detail is followed, but no compiler of an index can possibly tell just what datum may be desired for looking up by any individual, and it is important that anyone can find exactly what he seeks with the least modicum of research. In itself the index reveals a wide range of information covered in the twelve numbers of this little magazine, bearing upon the agricultural industries of these islands, in addition to the exhaustive monthly reports of the divisions of the agricultural department of this Territory.

One of the principal by-products of the national forests of Japan is furnished by mushrooms, which have yielded in one year a revenue of a million dollars.

Articles of clothing from wood fiber are being made in Europe. The material for a suit costs about fifty cents. Clothing made of this material, however, can not be washed.

REPORTS OF DIVISIONS.

Reports of the various divisions of the agricultural department for the month of December show effective work all round. In that of animal industry Doctor Nørgaard explains as fully as possible the mortality in the dog quarantine, fixing the responsibility largely on the importers of delicate—in some cases invalid—pets on account of their having brought in the animals at an inclement season. At the same time he renews in unmistakable tones the solemn caution against the introduction of rabies, hinting the possible necessity of prohibiting the importation of canine stock altogether. Particulars are given of a new problem in bovine tuberculosis control, arising from the absence of law to compel the inspection of milch cows whose product is not for sale. This he is handling in judicious manner. Hog cholera has re-cruded on the island of Oahu, the matter being complicated by reports of disease in various quarters which are doubted to be cholera. Great care is being exercised to save owners of hogs the expense of serum treatment where it may not be necessary.

Superintendent Ehrhorn shows the exclusion of several dangerous pests by the division of entomology, also the introduction of more beneficial insects to combat pests that are present. He gives interesting information on the white ant, whose discovery in the Capitol grounds arboriculture has lent fresh importance to its existence here. The prohibition of plant introduction here without a federal permit, mentioned by him, should be made as widely known as possible by residents in their correspondence and by the press.

In the absence of the superintendent of forestry the forest nurseryman, Mr. Haughs, tells of the work of that division, which shows a large distribution of young trees, considering the heavy drafts made upon the stock for some months previously. Nearly 3000 plants taken by corporations is pleasingly indicative of the continued interest shown in forestry on the part of big capital.

Superintendent Larrison reports steady progress by the division of hydrography on the different islands in the various means of determining the water resources of the Territory for irrigation, light and power. There is a suggestion that the service might be accelerated with additional funds.

To secure a merit badge in forestry, boy scouts are required, among other things, to identify 25 kinds of trees.

The largest tree in the United States is said to be the "Mother of the Forest," a giant redwood in the Calaveras bigtree grove in California. It is supposed to contain 140,619 board feet of lumber. There are, however, many claimants for the honor of being the "largest tree" and the "oldest tree," and these claims, according to foresters, can not always be verified.

DIVISION OF ANIMAL INDUSTRY.

Honolulu, Dec. 31, 1913.

Hon. W. M. Giffard, President and Executive Officer, Board of Agriculture and Forestry.

Dear Sir:—I beg to submit herewith a report on the work of the Division of Animal Industry for the month of December, 1913:

Bovine Tuberculosis Control.

Only a small number of dairy herds have been tested during the month, but among these it is worthy of note that a private herd, that is, one from which no milk is sold, and which for some reason or other has hitherto never been tested, was found to contain more than 33 per cent. of tuberculous animals. In accordance with the generally accepted interpretation and subsequent enforcement of the local milk ordinance, a milk producer who sells no milk does not need to take out a license, and, as only the applicants for licenses are referred to this Division for testing, the dairy in question escaped notice until our attention was called to it by the importation of five pedigreed "Dutch Belted" dairy cattle.

It was then learned that these valuable animals were to be part of an untested dairy herd consisting of more than 20 head, and it was made clear to the owner that in all likelihood it would not be long before the imported cattle would become infected and would have to be destroyed. The tuberculin test revealed the presence of seven tuberculous animals, all of which were found on post mortem examination to be suffering from the disease to a more or less advanced degree, one even having the lymph glands of the udder affected, and there can be little doubt that, had another six months been allowed to pass before the tests were made, every one of the animals not naturally immune would have been infected, and unless effectively segregated the disease would have reached the imported animals in short order.

This case goes to prove the danger of withholding the family cow or private herds from the regular tests, and it is the intention of this Division to locate all such cows or herds and persuade the owners to have them tested.

Applications are already on hand for the retesting of a number of the larger herds in which one or more reactors were found the last time, and this work will be resumed without delay.

Hog Cholera.

According to a report received from Doctor Elliot the disease has made its appearance among the hogs belonging to a plantation in the neighborhood of Hilo, where no hogs have been pur-

chased or brought in for a long time. Every precaution has been taken to prevent its further spread and, as the cases which have come under observation seem to be of a mild form and only a few have died, the outbreak does not seem to call for any action from this office. Explicit instructions have been sent to Doctor Elliot, who is fully capable of dealing with the situation.

The outbreak on Kauai has, according to Doctor Glaisyer, subsided, while the suspected outbreak in a large piggery near Wahiawa as reported on two months ago failed to materialize. Last week, however, the owner of the establishment reported that one large sow had died and two more were sick. The place was visited and a post mortem held which failed to show definite symptoms indicative of hog cholera, while pneumonia appeared to be the undeniable cause of death. Neither do the two sick hogs appear to be suffering from this disease, for which reason the immunization of the herd with serum was postponed to await the outcome of these cases. Unfortunately it cannot be definitely ascertained whether the disease has ever been in the herd even though a large number of hogs is said to have died during 1912. If these deaths were due to cholera there would be no great cause for alarm, but if not the appearance of the disease would undoubtedly result in great loss. For this reason everything is held in readiness for speedy action, but as the cost of immunizing this large herd will amount to several hundred dollars it was felt requisite that the diagnosis be definitely established first, even though the delay may result in the loss of a number of hogs.

Mr. Sheba, editor of the Hawaii Shinpo, informs me that hog cholera has again made its appearance in the Moiliili District, where it will be remembered the present epidemic made its first appearance and where it is said more than 1000 hogs died, in fact every hog in the district, before the fact was reported to this office. In an article on hog cholera published in the Hawaii Shinpo two months ago, it was urgently advised that no hogs be brought into this district or into any pens or sites where hogs had died from cholera without first being serum-immunized or else until at least six months had passed since the last death. This warning has not been heeded with the result that the disease has again broken out.

These enterprising hog raisers, all Orientals, are now looking for a tract of land where no hogs have been kept before, but if they continue along the same lines as hitherto, disregarding the advice and declining the assistance of this office, it will be but a short time before they will have the disease transmitted to the new place and possibly infect other places in the neighborhood (it was in Kalihi they were inquiring for land). It would therefore be well for them to realize that the sooner they adopt radical measures the smaller their loss will be, even though the initial cost of the serum treatment—two to three dollars per head of large hogs—does seem almost prohibitive. Mr. Sheba has kindly

volunteered through the columns of the Shinpo to elucidate the subject and to answer all questions pertaining to it, submitting those beyond his knowledge to this office. As this had just been written a telephone message was received stating that five large brood sows had died, while the two already sick seemed to be getting better. It was therefore decided to go at once to Wahiawa in order to ascertain, by post mortem examination of the dead animals, whether the cause of death was really hog cholera or whether faulty feeding or incidental poisoning of the feed by lye, pearline or other dish-cleansing preparations might possibly be held responsible. It was found that only one of the hogs showed any of the symptoms generally accepted as pathognomonic, that is, the ulcerations of the mucous membrane of the small intestines at the exact place where they join the large intestines, and these ulcers were so insignificant in size that it was decided to await further development before resorting to the serum treatment. In the meantime a chute was built for this purpose and the following day a careful investigation of the food supply, that is, the kitchen swill from the infantry and cavalry messes at Schofield barracks, was undertaken.

In this work I was kindly assisted by Doctor Mason, the senior veterinarian of the Fourth Cavalry, who accompanied me to all the various kitchens from which the concern in question obtains its swill. It would seem that, for some reason or other, a bulletin pertaining to the careful separation of edible swill from offal without feed value, such as coffee grounds as well as sweepings and other garbage, had been issued a few days previous, and that the requisite receptacles, large galvanized iron barrels with tight fitting covers, had been provided, at least three for each company mess. An inspection of these receptacles, however, showed in a number of cases that the one intended for the edible swill contained both tin cans, lemon peels and coffee grounds, and that the garbage cans contained much edible swill. In all such cases the mess sergeants were sent for and the injurious effect and heavy losses sustained by those who buy and pay for the swill were explained to them. Inquiries were also made in regard to the use of lye and washing powders in cleaning the dishes and pans, but in no case could it be found that such poisonous material had reached the swill barrels, even though it is possible that more or less empty lye cans and similar containers and cartons may have been thrown into them. It was explained that in the future the swill from each mess will be kept separate and fed to the same hogs every day in order that carelessness may be traced to the men guilty of it, and it is hoped that this measure will have the desired effect.

On a subsequent visit to the piggery it was found that all sick hogs seemed to be improving and that no new cases had developed, which speaks strongly in favor of the disease not being hog cholera.

That the losses sustained on this island have been considerable is testified to by the fact that the past month saw the importation of nearly two hundred butcher hogs from the Coast, the first such shipment for more than four years.

Rabies and the Dog Quarantine.

Alarming reports of the constant spread of rabies in the Pacific Coast States continue to arrive by tourists and visitors to the mainland as well as by the newspapers and official reports. Both Seattle, Portland and Vancouver appear to be badly infected, and were it not for the incentive to circumvent the law engendered by an order prohibiting absolutely the importation of dogs to the Territory such measure would be submitted for the consideration of the Board. In the meantime I regret to report the loss within a period of only two weeks of seven dogs in quarantine. As these dogs died from various causes no satisfactory explanation can be offered except the unusual cold and rainy weather which may have acted as a deleterious factor in reducing the vitality and power of resistance to ailments inherent or acquired by the animals in question. The suggestion of poisoning due to either negligence or malice is refuted by the official report of the federal food analyst and chemist, which is appended hereto. Intestinal parasites were prominent factors in every case and treatment for the same also tended to weaken the dogs, some of which were of very delicate constitution and should not have been imported at this time of the year. The complaints made about inadequate facilities for the housing and care of the animals at the quarantine station can at best be sustained in the case of three French toy poodles, which not alone were very delicate but also heavily infested with tape worms when they arrived, and as the importer was fully aware of the quarantine regulations and familiar with the premises it would seem that a more favorable season should have been selected for the importation of these animals, even though they came from more severe climatic conditions than those of Hawaii. To restrict or in any way change the regulations in favor of such animals can simply not be thought of, and while the climatic conditions of this winter may not occur again for years it is recommended that a small house be built containing 8 or 10 cages for lap or toy dogs in which such delicate animals can be kept at least during the night when the keeper cannot be near them. Such a house would be of value not alone from a sanitary standpoint but would also serve to guard valuable dogs against theft and accidents of various kind. Plans and specifications for such a house are herewith submitted.

I also beg to recommend that the keeper's quarters be enlarged so as to allow him to keep his family with him. The experience gained during the past few years has proved definitely that the position as keeper of the station must be filled by a reliable man

of good habits and that owing to the secluded location, more than one mile from the nearest street car line, a single man soon tires of the monotony and lonesomeness of the position and either develops bad habits or leaves the station unguarded for longer and longer periods unless he takes up with such company as can be found on the Beach Road after dark.

As I believe finally to have secured the services of a reliable man and one who is vouched for by the very best authority it would seem wise to provide quarters suitable for his keeping his family with him. In this connection I take the liberty to enclose some correspondence which is self-explanatory, and while I cannot, for obvious reasons, recommend the acceptance of the offer therein contained it nevertheless appears to me to be a guarantee of good faith and the desire for a permanent position through satisfactory services on the part of the present incumbent. If therefore this recommendation is favorably acted upon I shall be glad to prepare plans and specifications for the enlargement of the present quarters.

Very respectfully,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, Dec. 31, 1914.

Dr. V. A. Nörngaard, Chief of Division of Animal Industry.

Sir:—I have the honor to submit my report on the work during the month of December, 1913:

Tuberculosis Control.

The following dairy stock has been tested:

	T.	P.	C.
Mrs. B. M. Allen, 26 cows, 1 bull.....	27	20	7
Mrs. F. L. Whitney, 2 cows.....	2	2	0
Tom Hollinger, 5 cows.....	5	5	0
Antone Peris, 4 cows.....	4	4	0

Seven animals were condemned and branded out of Mrs. Allen's herd. This is a large percentage but was to be expected as no tests have ever been made in this dairy. The infection was undoubtedly brought in by a cow purchased from a local dairy some four years ago and which on post mortem examination was found to be badly diseased. In each case the local reaction was well marked and unmistakable and the reliability of the test was fully demonstrated on post mortem examination at the slaughter house. The results of these examinations are given below as follows:

No. 1. Carcass in fair condition and dressed 298 lbs. A few small semi-calcified nodules were present in the lungs; one supra-mammary gland showed the presence of small young tubercles; microscopical examination of smear preparations of the same showed tubercle bacilli.

No. 2. Carcass in medium condition and dressed 334 lbs. Calcareous nodules in mediastinal lymph glands and one small nodule containing cheesy pus in the lungs.

No. 3. Carcass in very good condition and dressed 404 lbs. Retro-pharyngeal lymph gland enlarged to 6 inches in diameter and contained a mass of cheesy, gritty tuberculous material. The lungs were a mass of nodules varying in size from a dime to 3 and 4 inches in diameter and in different stages of development. All bronchial and œsophageal glands were affected.

No. 4. Carcass in poor condition, dressing 288 lbs. One bronchial-œsophageal lymph gland was greatly enlarged and contained a mass of cheesy, semi-calcareous tuberculous material. No other lesions were found.

No. 5. Carcass in good condition, dressing 452 lbs. Retro-pharyngeal gland enlarged to 6 inches in diameter, containing large cavities filled with creamy pus, also small nodules filled with semi-calcareous tuberculous material. The lungs contained numerous nodules of different sizes and in varying stages of development.

No. 6. Jersey heifer in good condition, the carcass dressing 240 lbs. The disease was confined to a few small tuberculous nodules in the retro-pharyngeal glands and large abscesses in the liver.

No. 7. Holstein heifer in good condition, carcass dressing 320 lbs. The disease was confined to four small nodules in the right retro-pharyngeal lymph gland.

Thorough disinfection of the stable and premises was effected; it was also recommended that the use of the old barn and stables be discontinued and a new one erected in its place. The owners were also strongly urged to have the remaining animals re-tested at the end of three months as undoubtedly others are infected as all had been exposed to the disease for some time.

Importations of Live Stock.

Dec. 2—S. S. Honolulu, San Francisco: 1 Berkshire boar, F. G. Krauss. This boar was imported by Prof. Krauss of the College of Hawaii for breeding purposes and is to be used both at the College and at his Haiku homestead, Maui. Owing to the absence of health certificates the animal was held under observation for two weeks at the quarantine station and before leaving was rendered immune by a suitable dose of anti-hog cholera serum. 30 crates poultry of mixed breeds.

Dec. 3—S. S. Manchuria, San Francisco: 3 white French poodles, C. C. von Hamm.

Dec. 4.—S. S. Niagara, Vancouver: 1 white Spitz dog, H. Scott.

Dec. 8—S. S. Sierra, San Francisco: 1 dog (brindle bull terrier), Mr. Walsh; 1 dog (white Spitz), Mr. Heinfedro; 11 crates poultry of mixed breeds.

Dec. 14—S. S. Arizonan, Seattle: 14 horses, 1 cow (dairy short horn), 186 hogs, 23 crates poultry, A. L. McPherson. The above 186 head of hogs represents the first shipment of butcher hogs into the Territory since September, 1909.

Dec. 17—S. S. Lurline, San Francisco: 2 horses, Col. C. L. Reihm; 3 horses, K. Kanda; 2 horses, Quartermaster's Dept.; 1 goat, H. Waterhouse Trust Co.; 25 crates poultry.

Dec. 23—S. S. Wilhelmina, San Francisco: 35 crates poultry.

Dec. 25—S. S. Mongolia, San Francisco: 1 cat, steerage passenger; 1 dog (brindle bull terrier), Julius Bayer.

Dec. 30—S. S. Honolulan, San Francisco: 1 horse, Col. F. H. French; 4 mules, Hind, Rolph Co.; 13 crates poultry.

Respectfully submitted,

L. N. CASE,
Assistant Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

Honolulu, Dec. 31, 1913.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the work of the Division of Entomology for the month of December, as follows:

During the month 34 vessels arrived at the Port of Honolulu of which 22 carried vegetable matter.

<i>Disposal</i>	<i>Lots</i>	<i>Parcels</i>
Passed as free from pests.....	1201	26,805
Fumigated	14	1,914
Burned	69	77
Returned	1	1
Total inspected	1285	28,797

Of these shipments 28,532 packages arrived by freight, 104 packages by mail and 161 packages as baggage of passengers and immigrants.

Rice.

During the month 7115 bags of rice arrived from Japan, all of which was found free from pests and was passed for delivery.

Pests Intercepted.

Fifty-three packages of fruit and 4 packages of vegetables were found in the baggage of passengers and immigrants from foreign countries and being prohibited from entry were seized and destroyed by burning.

In a shipment of plants from Japan were found a number of *Anomala* grubs in the soil, also several *Scarabcid* grubs and an adult *Scarabcid* (*Cetania* species). In the trunks of two trees were found the larvae of a tree borer belonging to the *Cerambycidae* and two species of click-beetle larvae were found in the matted roots. The shipment was condemned and destroyed.

In another lot of soil around plants we found the larvae of a fly (*Tipulid*), a dung beetle (*Histerid*), and two species of ants (*Lassius niger* and *Prenolepis obscura*).

Nineteen plants were refused entry into the Territory for not having any permit from the Federal Horticultural Board of the U. S. Department of Agriculture, Washington, D. C. All of these were brought by passengers and immigrants from foreign countries and were seized and burned. Under Rules and Regulations of the Federal Horticultural Board it is absolutely necessary for all persons who either bring or ship into any State or Territory of the United States any plant or parts of plants, first to obtain a permit from the Federal Horticultural Board, Washington, D. C. Application blanks can be obtained from the Superintendent of Entomology of the Board of Agriculture and Forestry, who is the authorized agent of the Federal Horticultural Board.

All five-leaved pine trees are prohibited from entering the United States under Quarantine Order No. 7 of the Federal Horticultural Board. One such plant was seized and destroyed during the month. These species are susceptible to the white pine blister rust (*Peridermium strobi*) which has caused serious destruction to the pine forests of Europe and Asia and has found its way into a few limited sections of the United States.

One package of plants arriving by parcel post has been returned to the original shipper under orders from the postmaster-general. Hereafter no plants or parts of plants can be sent into the United States or Territories from foreign countries by parcel post. It has been found necessary to take these precautions on account of the difficulty of keeping check of all such shipments, which always present great danger of letting in some serious pest unobserved.

During the month the president of the Board handed me some material infested with white ants, which he had received from the Superintendent of Public Works of the Territory. The material was taken from the bandstand in the Palace grounds. The white ants infesting the material are the same as found by me in the wharf-piling on Pier No. 7 and which were also found doing damage to the woodwork in the building at Kamehameha School.

The species has been identified as *Coptotermes lacteus* and is recorded from Australia. From the present distribution here it must have been in the islands for a long time. Doctor Perkins in the Fauna Hawaiiensis, in writing on white ants or termites, mentions two species and also says: "One if not two other species have been imported and are probably established."

Hilo Inspection.

Brother M. Newell at Hilo reports the arrival of seven steamers of which four brought vegetable matter consisting of 226 lots and 4316 packages. One lot of holly was burnt on account of fungus.

Beneficial Insects.

One hundred *Coccinella bruckii*, an aphid eating ladybug, were given to the department by Mr. O. H. Swezey of the Hawaiian Sugar Planters' Association for distribution and were liberated in Manoa Valley where an abundance of aphid was found on hibiscus. These ladybugs were collected by Mr. Fred Muir in Japan and those liberated were reared by Mr. Swezey from the original sending, none of which were liberated on account of finding parasites infesting the pupae. Mr. Swezey has liberated large numbers of this ladybug on the various islands with the hope of getting them established. Four lots of Japanese beetle fungus were distributed on Maui.

Inter-Island Inspection.

During the month of December 58 steamers plying between the islands were attended to and the following shipments were inspected and passed:

Plants	392	packages
Taro	1045	"
Fruit	26	"
Vegetables	62	"
<hr/>		
Total passed	1525	"

The following packages were refused shipment on account of being either infested with pests or having soil attached to the roots.

Plants	10	packages
Fruit	12	"
Vegetables	1	"
<hr/>		
Total refused	23	"

Respectfully submitted,

E. M. EHRLHORN,
Superintendent of Entomology.

DIVISION OF FORESTRY.

Honolulu, Dec. 31, 1913.

W. M. Giffard, Esq., President and Executive Officer, Board of Agriculture and Forestry.

Dear Sir:—The following report gives the principal work done during the month of December, 1913:

Nursery.

Distribution of Plants.				
	In seed ^a boxes	In boxes transplanted	Pot grown	Total
Sold . . . . .	....	150	190	340
Gratis	1500	350	662	2512
	<hr/> 1500	<hr/> 500	<hr/> 852	<hr/> 2852

Collections.

Collections on account of plants sold amounted to \$ 4.30.

Plantation Companies and Other Corporations.

The distribution of trees for the month is as follows: 1000 in seed boxes, 1500 in transplant boxes and 400 pot grown. Total, 2900.

Makiki Station.

The work at this station has been principally routine; namely, sterilizing soil, transplanting trees and otherwise building up a stock which was getting low owing to the heavy demand which has been made for trees during the past two months.

Honolulu Watershed Planting.

The work on the face of Sugar Loaf is progressing and a great many holes are now ready for planting. These will be filled with koa trees just as soon as the weather is suitable. We have over 3000 koa trees in tin cans at the small nursery on the ridge below Sugar Loaf. Clearing off and making holes have constituted the principal work during the month.

U. S. Experimental Planting, Nuuanu.

With the assistance of the prisoners and one man from the Nursery, also the man employed to look after the trees, two days were spent in going over the different plots and filling up blanks

where trees had died during the dry spell. The most of the trees are making a splendid growth and are now large enough to take care of themselves. Owing to lack of funds the man who has been employed on this work for the past three years was discharged at the end of December.

Congressional Vegetable Seed.

By last mail we received from Washington 50 mail bags containing 10,000 packages of Congressional vegetable seed. Each package contains five varieties. The complete list is as follows: 3300 packages V-1—beans, lettuce, muskmelon, onion and radish; 3300 packages V-4—corn, lettuce, onion, radish and turnip; 3400 packages V-5—peas, cucumber, lettuce, onion and radish.

Very respectfully,

DAVID HAUGHS,
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

Honolulu, Jan. 12, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the Division of Hydrography during December, 1913, is submitted:

Construction Work.

The construction work in December in connection with the installation of 12 new clock register stations on Maui, four new clock register stations on Kauai, and 18 new staff gage stations on Oahu progressed more rapidly than during November on account of more favorable weather conditions. The program of replacing old staff gage ditch stations—which have in the past estimated the low water discharge of streams by the amount of water diverted by ditching—by clock register stations on the streams, at points above all diversions, will progress as rapidly as the semi-annual allotments of the territorial funds are made available.

There are now established, or in process of being established, on streams in this district the following types of clock register stations: Gurley, 1; Friez, 8; Stevens, 19*; Barrett & Lawrence, 6; Watson, 7—making 41 in all.

The installation of these stations involves more than the construction of intakes, wells and shelters, as these are, nearly always, established far up into valleys, both uninhabited and in-

* Three owned by cooperating parties.

accessible. These conditions require the construction of many miles of foot trail, bridges, or cables for flood measurements, the blasting and clearing of cross sections, and the building of permanent controls.

G. K. Larrison, Superintendent.

December 5, 9, and 26 were spent on reconnaissances of the Heeia and Kaneohe basins on windward Oahu. The construction of 18 stream and ditch stations in these basins was started on December 26. These stations are being built and will be maintained in coöperation with the Heeia Agricultural Co. on a half-and-half basis.

December 13 to 21 were spent inspecting the construction work in connection with the installation of the new Stevens clock registers on the Honomanu, Wailuanui, East Wailuaiki, West Wailuaiki, East Kopiliula, West Kopiliula and Hanawai streams on Maui. All of these stations, except the Hanawai, were completed with the exception of the foot bridges for flood measurements. The night of December 15 was spent in the rim of Haleakala crater, elevation 10,000 feet. A monthly rain and snow gage will probably be established at this place during the coming year.

The balance of the month was spent on general administration work, including reports, estimates, and computations.

W. V. Hardy, Field Assistant, Kauai;

D. E. Horner, Field Assistant, Kauai.

Mr. Hardy spent 30 days in the field, visited nine stream gaging and five mountain rain gaging stations, and made two measurements. Most of the month was put in on the construction of the Hanalei station.

Mr. Horner spent 31 days in the field, visited seven stream gaging and four rainfall stations. Twenty-seven days were spent on construction of the Hanalei and Kalihiwai stations.

J. C. Dort, Office Engineer, Oahu.

Mr. Dort spent five days in the field, visited five stream gaging stations, three rainfall and two evaporation stations, and made five stream measurements. The balance of the month was utilized on general office and computation work in connection with the 1913 Progress Report.

C. T. Bailey, Assistant Engineer, Maui;

Howard Kimble, Assistant Engineer, Maui.

Mr. Bailey spent 23 days in the field, visited 15 stations and made two measurements. Mr. Kimble spent five days in the

Honolulu office and 26 days in the field on Maui replacing Mr. Christiansen. He visited two stations and was employed all of his time on Maui on the construction of clock register stations on the Hanawai, West Kopiliula, East Wailuaiki, East Wailuanui and West Wailuanui streams.

E. O. Christiansen, Assistant Engineer, Maui.

Mr. Christiansen spent December 1 to 3 assisting Mr. Bailey on Maui, and from December 4 to 31 on vacation leave. His resignation to take effect on December 31, 1913, was accepted.

H. A. R. Austin, Junior Engineer, Oahu.

Mr. Austin reported for duty on December 27 and spent December 27 to 30 on general office work. On December 31 he accompanied J. C. Dort, office engineer, on a trip to Mt. Kona-huanui, Mt. Olympus and the Kaau crater to read rain gages.

G. R. White, Field Assistant, Oahu.

Mr. White spent 16½ days in the field, visited six stream gaging stations and three rainfall stations, and made seven stream measurements. From December 9 to 16 were spent on construction and improvement work in the Kailua valley, and from December 26 to 31 on gage installation and construction work in the Kaneohe and Heeia valleys, all on windward Oahu. The balance of the month was spent on general office and computation work.

Office Force.

Mr. E. E. Goo, clerk, assisted by John Kaheaku, computer, spent the entire month on general office work, including correspondence, filing, computing, checking, etc. Mrs. Sara Dort and Mrs. Hilda Kennedy were temporarily employed on December 8 at \$2.50 per day to assist on computation work in connection with the 1913 Progress Report.

Very respectfully,

G. K. LARRISON,
Superintendent of Hydrography.

There is a flourishing forest school in the Philippines, and 28 men were graduated with the class of 1913.

Under forest regulations in Colombia, rubber gatherers are required to give the trees a rest period in tapping them for gum. The size, number and location of the incisions are regulated by law. In the United States similar regulations are in force in the tapping of pines for turpentine on the Florida national forest.

THE KALO IN HAWAII (VII).

By VAUGHAN MACCAUGHEY and JOSEPH S. EMERSON.

THE CULTURAL REQUIREMENTS OF KALO (*Concluded*).

In the latest issue of the *Forester* the cultural requirements of the Kalo in Hawaii were discussed in some detail. In recent years there has been a movement on the part of the National Department of Agriculture to establish the kalo and related aroids among the root-crops of the Southern States. The cultural requirements in these regions differ somewhat from those in Hawaii, and the contrasts may be shown by the following extracts from recent bulletins by the U. S. Department of Agriculture:

"For many years the lack of a wet-land root crop has been felt throughout the South Atlantic and Gulf States. In view of the fact that some 40,000 acres in the Carolinas and Georgia have been fully abandoned, with at least half as much ground that is only planted once in two to four years on account of the decreased profits in rice culture in that section, an effort has been made to find profitable crops which may be grown in the rich soils of the coast-plain area of both of the regions mentioned, which are too wet for profitable potato culture.

"The recent increase of interest in starch roots, which may be utilized in the production of alcohol as well as for stock feeding, has lent a still greater importance to this question.

"The aroid root crops are practically new to this country and come from the Tropics. However, their crop season is sufficiently short to allow of their maturing in ordinary seasons before the advent of killing frosts; in fact, one or two of the varieties have been successfully grown with a fair yield as far north as central New York."—*Barrett, Bur. Plant Industry, Bul. 164.*

"The dasheen* requires rich, sandy soil, very moist but well drained. The plant will not be greatly injured by occasional flooding for a short period. Such lands as the so-called hammock lands of Florida are especially adapted for the cultivation of this crop. And low-lying sandy land that is fairly well drained, but still too wet for general field crops, can be used to advantage. On these low lands it would be advisable to plant on ridges.

"Planting should be done as early in spring as the conditions of soil and climate will permit. This may be as early as the first of February in southern Florida and as late as the last of March or the early part of April in the Carolinas.

"Preliminary experiments indicate that it does not pay to use very small dasheens for planting if larger tubers are available, as this may result in the yield being reduced by as much as 15

*The dasheen is the taro of the West Indies and China.

per cent. Tubers of 3 to 5 ounces in weight are preferable for planting. For field culture the tubers, unless very small or very large, are planted, singly and entire, from 2 to 3 inches deep in hills 3 feet apart, the distance between rows being 4 feet. This will permit horse cultivation. In cultivating during the summer the soil should be gradually drawn to the plants and the plants kept free from weeds; they usually require little cultivation after becoming large enough to shade the ground. Well-grown plants will reach a height of $4\frac{1}{2}$ to 6 feet or more by midsummer.

"The crop matures in about seven months, although the tubers can be utilized for home use in six months or less from planting. The harvesting of the main crops may be deferred a month or two, if desired, but if it is to be done at one time, in order to have warm, dry weather for the dasheens to dry properly on the ground, it would not be delayed till there is danger of frost. For this reason it will usually be best to harvest dasheens sometime in October. It will sometimes prove advantageous in practically frost-free localities or where the roots can be protected to leave them in the ground until wanted for use or until spring.

"Where soil and climatic conditions are favorable, dasheens will produce from 4 to 10 pounds or more to the plant. Under experimental conditions at Brooksville, Fla., in different soils and in different seasons, the Department of Agriculture has secured yields ranging from 140 to 450 bushels to the acre. Satisfactory results have not been obtained, even in good soil, when two successive crops of dasheens are grown on the same ground.

"The growing of a dasheen crop is probably no more expensive than that of a potato crop. Although the season for the dasheen is much longer than that for the potato, the large leaves of the former tend by shading to keep down weeds after midseason."

—Young, *Office of Plant Introduction, Circ. 127.*

Geographical Distribution.

Kalo is supposedly a native of India, from there having been taken to Ceylon, Sumatra, Malay Archipelago, China, Japan and Egypt. In more recent times it was brought to Fiji and New Zealand.

The Rev. T. G. Hammond, in an article on the kalo in the *Journal of the Polynesian Society* (Vol. 3, 1894, p. 105), gives the following: "Commonly received tradition all along the West Coast of the North Island of New Zealand . . . respecting the origin of the taro . . . A great ancestor of the Ngaururu and Ngatiuani tribes, named Maru, in one of his voyages from Hawaiki, touched at an island called Te Wairuanguana, and there became aware of the taro as an article of food.

"On his return to Hawaiki, Maru took with him some of the broad leaves of the taro, which, together with his description of the food, so excited the people that they fitted out an expedition to find again the island Te Wairuanguana, and to secure

roots of the plant for cultivation. The expedition consisted of two canoes, well manned, and named respectively '*Pahitonoa*' and '*Hakirere*.' The former canoe was commanded by Rauru, and the latter by Maihi.

"On the outward voyage, *Pahitonoa* was wrecked, Rauru and the survivors being rescued by the crew of *Hakirere*. Going on her way, *Hakirere* arrived safely at Te Wairuangaana, and application was made to the inhabitants of the island for roots of the taro, which were presented to them by two women, who gave them directions as to the cultivation of the plant, and the requisite behavior on their return journey with such valuable food on board. Following these directions, Maihi was enabled to return safely to Hawaiiki, and accordingly introduced the taro to that land."

According to the ancient Samoan mythology "occasional visits are stated to have been formerly made to the abode of the august Tangaloa (the creator or chief god), by parties from the earth, who returned with some useful benefaction from the deity; as for instance, Losi, who is reputed to have been the benefactor of his countrymen by bringing taro from the skies (*O le langi*) on his return from one of his expeditions, or presumably, voyages, to the north-north-east or north-west." Rev. John B. Stair in article on Mythology of Old Samoa, *Journal of Polynesian Society* (Vol. 5, 1896, p. 36).

It was doubtless brought, by the early Polynesians in their migrations, to Samoa, Tahiti and finally to the Hawaiian Islands. According to certain legends of the ancient Hawaiians, the kalo originated from the "piko" or umbilicus. A number of varieties are called *Piko*.

Comment has already been made upon the fact that certain regions were preëminently adapted to kalo growing, and other regions were quite unsuited. This condition naturally led to traffic in kalo or *ai pa'i*, as its portable state was called. This traffic has continued down to the present time. The Honolulu region, on Oahu, the Lahaina region, on Maui, and the Kau district, on Hawaii, are instances of localities that receive much of their kalo supply from other places.

Regions noted for the growing of kalo are the Waipio and Waimanu Valleys, on Hawaii; the Waihee and Wailuku districts, on Maui; the Wailua, Pelekunu, and Halawa valleys, on Molokai; the Waialua, Kahana, and Ewa regions, on Oahu; and the Hanalei and Kapaa regions on Kauai. There were many other regions famous in ancient times, the above are representative. In general, the islands of Hawaii and Maui, because of their extensive upland regions, were devoted to dry-land or un-irrigated kalo; Oahu and Kauai, skirted by broad lowlands, were given over to wet-land or irrigated varieties.

Its history in Hawaii is therefore as long and as full of interest as that of the people themselves. Indeed, the kalo probably has as long a period of cultivation as any other plant can

boast of, for it was one of the plants to be earliest utilized by man. It is a staple food of many primitive peoples, because of its easy culture and great food value.

9. WET-LAND CULTIVATION.

The selection of land suitable for kalo-raising is based upon the considerations discussed under Cultural Requirements, and upon such other factors as market facilities, and disposal of crop.

The site having been chosen, the land is cleared. In Hawaiian this clearing process is called *waele*. Rubbish, weeds, and grass are burned off, and stumps, boulders, and other similar impediments dug up. The boundaries of the patch, which are to be embankments, are determined by the shape of adjacent patches and by the water levels. In the Hawaiian language, *mahina* indicates a cultivated patch or field; when cultivated in kalo it is called a *mahina ai*. *Ai* in its most general sense means food, whatever is eaten. More especially it is vegetable food as distinguished from *i'a*, fish or animal food. As wheat and other grains furnish the material for bread, the European "staff of life," and rice is the staple food of Asia, so kalo is *the food* of the Hawaiians, and in the words *mala ai*, *mahina ai*, *ai paa*, *ai pa'i*, *pa'i ai*, *holo ai*, etc., *ai* always signifies kalo or some form of food prepared from it.

The terms *pa'ava* and *kuakua* were also generally applied to both wet and dry fields of kalo.

Dry land fields of kalo or sweet potatoes were designated *mala*. This word was never applied to wet patches, which were always called *lo'i*.

A narrow strip of planted kalo, much longer than wide, was called *mo'o*. *Mo'o* is a general name for all kinds of lizards. A long narrow strip of land, from its resemblance in shape to a lizard's back, was called *mo'o*. If planted with kalo it was called *mo'o ai*. If it consisted of a long row of *lo'i*, or wet kalo patches, it was called *mo'o kaupapa lo'i*.

Kalo as it is usually grown in the *lo'i*, or wet land patch, requires considerable water. The digging of water-courses and keeping them free from weeds became a very important matter in the olden times. These water-courses, often of great length, showed no little engineering skill in their construction, and the regulations which necessarily had to be made and enforced to give each patch its proper allowance of water were very precise, and often complicated. From this it will be seen that as water or *wai* was the prime necessity in the cultivation of kalo, an abundance of water, *waiveai*, signified wealth, and the regulations relating to the distribution of water, *ka na wai*, signified law in general. Thus the Ten Commandments becomes in Hawaiian *na kanawai he umi*, the ten water regulations.

The Hawaiian name for rushes or coarse swamp grasses was

akaakai; *lo'i akaakai* designated that particular type of field that was formed by bending down the rushes, covering them with dirt, and then irrigating the field.

The ground within the *lo'i* is broken by means of a mattock or *oo*. *Oo* designates the tool largely used by the natives in cultivation in preference to the implements of modern farmers. The *oo* closely resembles in its manner of use the sharpened stick of *kauila* or other hard wood, used by them previous to their knowledge of iron. The first metal *oo* were blubber spades brought here by the whaling-vessels. The boundaries of a *lo'i* depend largely upon the shapes of adjacent *lo'i*, and upon the relative positions of the various levels along which the irrigation water is to run.

The embankments of the *lo'i* are built up of stones and clods of earth. These embankments were commonly known as *kuauna*.

In former times the *kuauna* between the *lo'i* was much wider than at present. They served as a convenient place on which to throw the grass and weeds pulled up from the *lo'i* until they were wanted as fertilizer. Often sugar-cane, banana plants, or the *ki* plant, grew luxuriantly on these *kuauna*. As *kalo* land increased in value the *kuauna* naturally shrunk in width, and with the advent of the Chinese planter they were often made too narrow to walk upon dry shod. *Hoohu* meant to run along the bank of a *kalo* patch.

Names less frequently used, for the embankments of the *lo'i*, were *ika*, *kaika* and *kuaio*.

The side or border of an upland *kalo* field was called *iwi*. *Iwi* means a bone, a name applied to the long rows of stones gathered from the *mo'o aina* or to a narrow strip of upland to be planted with *kalo* or potatoes. These *iwi* always run in the direction of the slope from the sea towards the mountains. As they coincide with the division lines between the fields, the term *iwi aina* came to mean the boundaries between such lands, and is a term often used in that sense in the descriptions in the Hawaiian language on record in the Land Office.

If necessary considerable soil is taken from the *lo'i* and put upon the embankments so that the surface of the *lo'i* will be below the level of the water supply. *La'ola'o laau* were the little sticks put down to sustain the *kuauna* or bank of the *kalo* patch. Water is then turned in and is soon soaked up by the broken soil. While the ground is still wet it is dug up or plowed several times. The Hawaiians call this labor *mahi-ai*.

It is evident that after long and continuous usage as described above, the soil is sure to become exceedingly sticky, so that the air does not penetrate it. Experiments conducted by Mr. F. A. Clowes in cooperation with the Federal Experiment Station, Honolulu, show that it is desirable to expose the soil, from time to time, to the action of the air. This is accomplished by plowing the fields as deeply as possible after the removal of each crop.

The soil then remains exposed to the ameliorative influences of the weather for a month or more. After this it may be harrowed or worked by hand, and brought into condition to be soaked with water and planted. The thorough plowing, airing, and drying of the soil before replanting greatly increases the yield, and greatly reduces the liability to disease. According to Mr. E. C. Bond, the natives of Kohala, Hawaii, in former times, allowed the *lo'i* to remain fallow for two or three months after each crop—long enough to allow the grass, weeds and other rubbish thrown into the *lo'i* to rot. Sometimes they added fresh soil to the *lo'i*. The Chinese planters, on the other hand, are not in the habit of giving the land a rest. Consequently, while the natives raised good *kalo* with many *ohá*, the Chinese get small *kalo* with almost no *ohá*.

In preparing the land for planting, cattle are sometimes turned into the patch and driven around in it so as to break the clods and puddle the bottom that it may hold water. In ancient times, the solidifying of the bottom was done wholly by hand, large stones or logs of wood being used as pounders. This work was called *paluku* or *paku'i*. The *ha-niu*, which was the thick large heavy end of the coconut leaf, was used for beating the sides of the patch. After the soil by these methods has been put into good condition, and the embankments are solidly plastered with mud, the field is harrowed and water is turned in to stand for a few days.

It is interesting to observe that the primitive Hawaiian "taro patch" is very similar to the rice-patches of the Orient, in construction, configuration, and maintenance. The following description of the rice fields of Japan, by Mr. S. A. Knapp, of the U. S. Dept. Agriculture, would apply perfectly to the wet-land *kalo* fields of Hawaii. "The lands are divided by levees into small fields. These are of no regular form . . . The levees vary in width from 1 foot for field divisions and paths to 4 feet for main embankment roads. . . . Many of the rice fields in Japan average scarcely more than 35 feet square, and the boundary levees have such wavy lines that they look as if made by hogs in a frolic. Under modern conditions the horse and the ox could be used in tillage, but there are no paths which such animals can traverse to these minute fields; and, if there were, the tracts are too small for the use of plow or harrow, because there is no room to turn, much less to follow the angular boundary lines. If a farmer owns several tracts it is seldom that they are adjacent. . . ."

Mr. Knapp describes a tract of twenty-five acres that formerly contained 409 irregular fields. By proper replatting there are "now 138 regular fields, with perfectly straight water-courses and roads wide enough for two loaded carts to pass . . . the area of arable land is greatly increased by breaking down

the numerous grass ridges and throwing their space into productive soil. About one-tenth is thus gained." (Bur. Plant Industry, Bull. 35, p. 16.)

(To be continued.)

HAWAII FOR CORN.

Dr. E. V. Wilcox, agent in charge of the federal experiment station, sees corn coming into its own in Hawaii. Corn will be one of the large crops here, according to Doctor Wilcox. He says in the Honolulu Star-Bulletin:

"Corn is coming into its own in Hawaii. The territorial marketing division finds that it can sell 15 tons of corn per week at \$40 per ton or better. This is nearly \$15 per ton above the farm price of corn on the mainland. But a thorough shakeup in the corn business is needed. In getting a fresh start in agriculture in Hawaii attention should be given chiefly to plain, ordinary farming—to raising things to eat. Put corn at the head of the list. There is no crop equal to it as food for man and beast. Recent repeated experiments have shown that it is superior to wheat, barley or rice. There is no other grain on which animals can be raised from weaning to maturity without balancing the ration with other feed. I recently saw fine healthy hogs which had tasted nothing but corn and water from the time their mothers weaned them; while other hogs, fed on wheat or barley, were half-size and sickly. Corn is sometimes said to be 'heating' as a horse feed. But there are thousands of sleek horses in the hottest parts of the South, which never saw any other grain than corn.

"It is curious that in Honolulu corn should be thought good for chickens only. Corn beats barley for horses any day. But until corn is fed more extensively to other animals than chickens, don't raise any corn except varieties with small kernels and of rich yellow color. Big-kernel corn can hardly be sold at any price in Honolulu.

"The farmers of Hawaii should raise what is needed for food in Hawaii. Make corn one of the main things. Horses, cattle, pigs, chickens and turkeys will rise up to bless you for it. And why forget man? Why not have a mill to make corn meal? Did you ever hear of a man who would turn up his nose at corn-meal mush, johnny cake, corn pone or hominy? Did you ever hear of a case of beri-beri or malnutrition in corn-eaters? The 'corn-fed' girls of the middle states are the standard of human perfection. If the Orientals would eat corn in place of rice, they would have better bone and muscle, and would become Americanized sooner.

"A Little Rock editor once said that Arkansas produced corn of such virtue that whisky made from it tasted just as good coming up as going down. The Hawaii brand of corn is equally

good. But when young pigs sell at 30 cents per pound, and chickens and turkeys at 35 cents, it pays better to transform corn into meat and padding for human ribs. Judged by mainland standards, Hawaii should have 100,000 acres of corn. With a little patch of corn like that "in our midst," Australian meat, Japanese rice and mainland cold-storage poultry could stay at home to feed other hungry mouths."

SOME INTERESTING POULTRY QUESTIONS ANSWERED.

To a correspondent who has sent a number of queries to the *Poultry Magazine* of South Australia, Mr. Graham Hope replies as follows:

Q.: (1) How long is it necessary to feed chicks on the dry method system as contained in a former issue? (2) At what age are chicks supposed to reach maturity? (3) How to feed them when they are matured for (a) egg production, (b) breeding purposes, (c) to bring on an early moult? (4) How long is it absolutely necessary to give onions to chicks as a prevention against worms? (5) Is it necessary to separate pullets from cockerels if they have free range? (6) At what age can chicks do without a foster-mother?

A.: (1) We feed our chicks on the dry feed method until they are matured. After two weeks old the dry meal consists of a very large proportion of bran, the oatmeal being reduced. (2) The age at which chickens mature varies from less than six months to eight or nine. The heavy breeds take longer than the light ones. Pullets nearing maturity should be fed on a very plain diet, no meat or stimulating food being used, so as not to force egg production at too early an age. (3) (a) We never force the pullets for egg production, but feed on the same simple diet as used at the Australian laying competitions. Again ample green food together with milk I find the secret for great egg production without the ill-effects of forcing the birds by use of meat and stimulants. Don't overfeed, as a fat hen means no eggs. (b) Grain at night buried in deep litter to make them work for their food. Every other morning a mash consisting of 2 parts bran, 1 part chaffed lucerne mixed with boiling water, and then left for half-an-hour to swell out, after which period it is dried out with pollard to a crumbly consistency. A small portion of salt is added to the boiling water. Never feed in a warm state or any condiments added, as this would force egg production, and would mean weak germs. On the other mornings grain is fed in litter. Mid-day ample green food is given. In summer each bird gets a half-teaspoonful of Epsom salts in the mash at intervals. Only give as much food as they will eat up greedily, and keep them busy; a fat, lazy hen is a bad breeder. (c) Knock off all soft food and rather underfeed, giving Epsom salts in the drinking water; as soon as the moult has well started

give soft food, with a pinch of sulphur added. Both sunflower seed and linseed meal are valuable additions to the bill of fare during this period. Green food is important. By putting the birds in a warm coop the moult will be hastened. It is generally accepted that it takes a fowl from 90 to 100 days to change its coat of feathers. (4) We give our chicks onions up to two months. We find this vegetable one of the most valuable for poultry, and give it freely to the adult stock. (5) I should advise the separation of the sexes, as otherwise the pullets are liable to come on to lay at too early an age. (6) It all depends on the style of foster-mother used and weather conditions. During this month our chicks at one month old have had no foster-mother.

Your queries have keenly interested me, and I trust my replies may be of some service.—*Agricultural Gazette* (N. S. W.)

CAN MULES BREED?

La Hacienda shows a photograph that says Yes! How often, we wonder, have all those to do with estate work, either in North or South America, as well as in many other centres, discussed the "whys" and the "wherefores" that prevent a mule from breeding. We have always understood that such a thing is impossible. Venezuelan llaneros, American breeders, negro overseers, Spanish hacenderos, East Indian coolies, even Portuguese and Chinese shopkeepers, have all in turn discussed the matter with us, and proved conclusively that for a mule to foal is impossible. In spite of all this, our contemporary, *La Hacienda*, of Buffalo, triumphantly includes a photograph of a mother mule and a foal, with these words underneath (see their August issue, p. 349): "Mula que dio á luz un potrello en la Hacienda Hortela, Pilar de Alagoas, Brasil." (Mule which gave birth to a foal on the Hacienda Hortela, in Pilar de Alagoas, Brazil.) Surrounding the two animals, which stand side by side, is a crowd of twelve men and boys, and probably there were others that could not be squeezed in the picture. We wonder whether all of these realized at the time how many tongues will be set wagging again over this evergreen controversy, at the sight of the photograph of this mother and son, since *potrello* not *potrella*, is used.

To further remove any doubt on the matter, we reproduce the following paragraph from the *Agricultural News* of Barbados, W. I., of a similar case in Cyprus, but in this instance it will be seen that two young mules had made their appearance. This would disprove any claim of the occurrence being a freak.

Under the heading "A Fertile Mule," our West Indian contemporary reports that some very interesting correspondence recently appeared in *The Field* (August 2nd and 9th, 1913) concerning the case quite lately observed in Cyprus, of a female mule with foal at foot. The observations were recorded in the first

instance by G. J. Harvey, M.R.C.V.S., Government Veterinary Surgeon, Nicosia, Cyprus. When called to the case he was informed that the foal was the second one born; last year the animal had given birth to a filly foal which lived two months. The present one was a colt foal two months old by a jack donkey and resembled somewhat a young donkey, but was bigger. The mule herself was 6 years old, 13.2½ hands high, and bay with black points. There were no special marks or stripes, and the animal was of a very good type. Inquiry seemed to indicate that she was bred from a she-donkey, sire unknown. At the time of writing she was giving milk, and the foal suckled in the presence of the veterinary surgeon, who was able to certify that both mule and foal were genuine.—*Tropical Life*.

A rancher has applied for the rental of 320 acres on the Pike national forest, Colorado, to be used in connection with other private land, for raising elk as a commercial venture.

The navy department has asked the forest service to investigate guijo, a Philippine wood, for possible use in decking boats and ships. Longleaf pine, sugar maple, and beech are the domestic woods most used for decks.

Hawaiian Gazette Co.

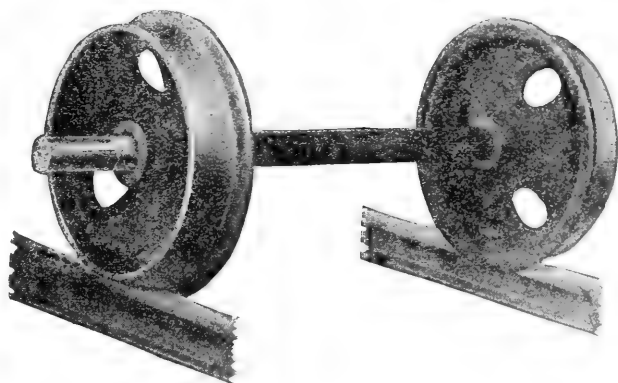
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All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications
SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207,
HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent.

THE HAWAIIAN FORESTER AGRICULTURIST

VOL. XI.

FEBRUARY, 1914.

No. 2

Divisional reports for January elsewhere speak for themselves in the showing they make of activity and progress in each case.

Some clear and compact notes on pineapple culture, being a paper by Mr. C. G. White, adds much to the value of this number of the Forester.

Prof. Silvestri's report of his expedition in Africa in search of fruit fly parasites has been issued in bulletin form. A review is deferred on account of crowded space.

Through inadvertence the Index to Volume X was not mailed with the January number. It will reach Forester readers with the present number, answering many inquiries from the islands and mainland.

In this number is begun the publication of a thesis on alfalfa, by Mr. Meinecke, a student of the College of Hawaii, with an introduction by Mr. Krauss, professor of agronomy in that institution. It will run for seven or eight months.

NOTES ON PINEAPPLE CULTURE.

Paper read by C. G. White before the Homesteaders' Association, Haiku, Maui, Oct. 18, 1913.

There does not seem to be anything in pineapple plant selection for uniformity and shape of fruit. In my experiments to this end, crown plants from cone shaped fruit, and from multiple crowned fruit growing side by side, all produced normal fine barrel shaped fruit. It is my judgment that coned shaped fruit occurs most often in the winter crop, especially on poorly prepared ground, the cause being a check to the feeding ability of the plant.

The best prepared and cultivated ground gives the most uniform fruit. The same condition also seems to have something to do with an early yellowness inside the fruit, while the outside is still green.

I do practice a rough selection, making for vitality. Sick

plants are removed from the fields and partially rotted plants are not replanted, even when enough is left. It does look as though there is something in such practice. I have a neighbor who started at the same time as I did, who planted everything. He is now buying plants from me in preference to using his own.

Thorough preparation of the soil before planting pays. If the soil is plowed several times, much harrowed, and well sunned for some months, so much the better. This sunning is particularly necessary on old ground. The second planting is very subject to rot. Sunlight kills the *Thielaviopsis* spores if it can get at them.

The plowing, after the first breaking, should be deep, but not into the subsoil, which is generally poisonous here. I have traced pineapple roots twenty inches deep in good soil. The last plowing should require little or no harrowing. The soil should be in good condition by this time from previous work on it. This plowing should just precede the planting. A test for fitness is the ease of planting. A well harrowed piece of ground, but hard beneath, should be replowed.

One effective method of loosening the subsoil is by dynamite. I cannot say it pays to use it generally, but I suspect it does. I have used it very successfully on a spot having an impervious subsoil so near the surface that water ran on top after every shower of importance. The cost is about \$17.00 an acre. One stick of 20% dynamite is placed every twenty feet, about five feet down and well tamped. I intend to use it regularly now. At least it will help deepen the soil, and that is much needed in places.

The growing of a legume to plow under greatly aids the second planting, but it must be plowed under in time to rot and in time to thoroughly work the soil—perhaps six months previous to planting is not too much. There are lots of legumes for green manuring, but some have root knot and are of questionable value on that account. There are two fine growing *dolichos* beans found wild here that are in this class. *Crotalaria*, or rattlebox weed, that grows hereabouts is the best renovator I know. Pigeon peas are good, but perhaps a little coarse.

Fertilizers so far have hardly proved worth while on the first crop, except on some backward spots. Apparently they are almost a necessity on second planting, and are profitable here on ratoons. I apply a half ton to the acre, or more, usually more, using a Planet Jr. No. 20 fertilizer distributor, but I hope for something better. I would distribute broadcast but that this method makes the detection of mealy bugs more difficult. Besides this, our climate is pretty windy for it. In Florida acid phosphate without lime is considered detrimental. On Oahu acid phosphate is recommended for manganese soils, I understand. Also in Florida certain combinations with sulphate of ammonia are condemned if not the material itself. Here in Hawaii sulphate of ammonia is usually recommended. A combination of blood, bone

and sulphate of potash is both a good and a safe mixture. Sulphate of ammonia can be mixed with this to advantage perhaps. I have some pot experiments that indicate that gypsum is a benefit on subsoil. The experiment station recommends humus, and also burning. Lime is little, if any, benefit to the crop.

I plant between nine and ten thousand plants to the acre. At present I space plants 48 inches between rows by 14 inches in the row. I have tried all ways, and think this approximately the best for horse cultivation and profits. There is little good in massed rows of any sort. They increase expense, and decrease size of fruit. If I could not use animals at all I would plant 40" x 16". As an aid to planting I have a 400-foot small cable wire marked for spaces, and held by an iron stake at each end. These stakes have an offset or shoulder so that they can be shoved into the ground with the foot like a shovel is. On one stake I use a grip so that the wire can be shortened without wrapping it around the stake. The blade of the planting mattock is 12" x 3". This is more efficient than an ordinary eight-inch grubbing hoe. The mattock man works with a mate, who slips the plant into the hole before the dirt has a chance to fill it up.

To free the new plants from mealy bugs, I use a large tub and a drain table made of a piece of corrugated roofing iron, with flaring wooden sides. At the lower end of this table is a spout, and the upper end is left open so that the drained plants may be pushed off. In my notes of seven years ago, I find that five men planted 1800 suckers a day, and I thought they were doing good work. Now five of my men plant over 4000, and quit at 2:30 p. m. The day's work when plants are not dipped, is for the gang to strip and plant per man 800 suckers, or 1000 slips, or 1200 tops, and they do this easily and well. Dipping the plants will decrease the average about fifty plants per man, not more. Suckers are planted six to eight inches deep, at least, and other plants are put as deep as practical. The effect of shallow planting is that the plant is less likely to stay thrifty. It does not pay to pack the soil about the plant except in very dry weather. This year is the first time I have ever noticed any gain by so doing.

Beginners usually strip too much. In a wet season it is little use to strip tops at all. In winter planting I leave all their leaves on; and with suckers I only remove three or four leaves up one side. The plants start a little slower. The ends of suckers are cut off only when the shank is very long or very crooked. The way to strip a sucker is to start three or four leaves up the side, and take all the rest off at one time, shucking sidewise as you do a top.

It is customary to replant two or three times, removing all plants that look badly, or that pull up easily because of shank rot, or from shallow planting. Sometimes there is an almost perfect stand. At other times there is a loss of 75%. Four or five per cent. loss is nothing to think twice about.

The best time to plant is from May 1st to October 1st. I usually begin in April and finish up in October. It does not pay to plant inferior plants. I do not sort closely to size. My practice is to plant nothing but suckers, and slips large enough to compete with suckers. In this way I save six to twelve months on the plant crop, and the harvest is prolonged. As much as half the crop comes in the off seasons. It costs more to pick scattering fruit, but there is no lazy season and no rushed harvesting. To my mind there is no crop that keeps labor as ideally employed all the year round as pines grown by this method. Suckers that are too mature quickly show a bud, these are weeded out with the sickly plants.

Many plants rot because of rough handling. The shank of a sucker must not be roughly twisted in detaching it from the parent stalk, nor should any plants be trampled. It is easy to remove suckers carefully. I allow one plant to grow two suckers to fruit, and no more at any time. To remove the surplus shoots from the parent stem, the leaf below the shoot is removed first, and the sucker is pulled outward and then sidewise. A vigorous sucker or top is good to plant; but a lush, soft one is no better for propagation than any other sort of lush plant. A dried sucker is undoubtedly more resistant to rot when planted than a fresh one. In practice I plant as soon as convenient after the picking.

The less our soils are stirred when wet enough to puddle, the better for us. As a choice of evils we often do have to hoe the crop when the soil is too wet.

The way I plant, I can horse-hoe for about nine months and again for a few times after the plant crop is off. The hoeing woman gets \$1.50 an acre per month when the horse hoe is operating and \$2.50 when she does all the cultivating herself. If the field is ridged she gets fifty cents more, as the work is increased, and our most efficient tool, a scuffle hoe, can only be used a little, since it levels the ridges too much. I do not believe in hoeing contracts based on tonnage. I have a general bonus system in which those engaged in the other important operations share. A half cultivated field gives the tonnage man too much for what he does. It works out in actual practice that the man is at something else more than he should be.

It is humane and profitable to keep the help supplied with gloves. At present I use a cloth glove, leather faced, costing 25 cents, but I hope to do better with a better glove. A pair of these lasts about three days in sucker picking, and about three weeks in other work. In the Florida fields, gloves are made of ten ounce duck. I have never been able to buy them.

The small-tooth horse cultivator is not an effective tool; as it has a tendency to work the dirt to the middle of the row, leaving the roots to be washed out by the rain. For first use in a sucker field I like a regular six-toothed cultivator, arranged to

close the outside furrows. Among tops and large plants I like sweeps—the narrow V-shaped, sharp-pointed sort. If the plants are finally left slightly ridged, so much the better. Where there is questionable drainage a big ridge is fine. It might pay to always ridge high, despite the added cost of cultivation.

The custom of having the horse led in horse hoeing is not entirely to be condemned. It is much quicker, there is less damage, and it makes for a better job generally. A pine root cut never grows again, so care is worth while. Most of the labor is so unskilled that one man to a horse hoe is impossible, anyway. When it comes to horse hoeing among large plants, the singletree should be raised up under the horse's tail, using a backband over the rump to keep it high, and a belly band to hold the traces low at the collar. With short traces this works well; and the animal gets used to the singletree touching his hams when the pull is slack. The singletree must be well above the hock or the horse will bang himself. It is surprising how long cultivation can be continued with this arrangement, and with the horse hoe equipped with large sweeps, say 1 fifteen-inch and 2 twelve-inch Planet Jr. improved sweeps. When the ground is too hard, a half bag of dirt on the horse-hoe helps hold it to the work.

So far as I know at present, an old field can be best renovated by chopping up the old plants with a heavy hoe not too much angled, followed with a weighted disc harrow to hurry the rotting. The harrow will need pressure boards, otherwise the stools will bunch up in front. A pressure board on a disc harrow is a good idea most any time.

This renovating work is best done in the winter season, as rot is most active then. I would have the stools all well rotted before plowing the land, even if the job is a long slow one. You kill the plants, save their fertility and humus, and do not sour your soil. Unrotted stools grow, if plowed under. In the near future there will be tools to do this work easily and cheaply. Killing the stools with poison sprays also has possibilities. I have just planted an old field where the plants were surface rotted, the soil dynamited, and fallowed for six months. This soil plowed finally as freely as new ground would have plowed.

Wilt seems to be a matter of heat and indigestion. It attacks the thriftiest looking plants, mainly in the lower altitudes.

Rot is on the increase and may prove a bad enemy. I have indicated the way to fight it in new fields.

The way to get rid of mice is to poison them. Take one-half cup flour, moisten with cold water, stir in one and one-half pints boiling water in which has been dissolved one teaspoonful of saccharine and one ounce powdered strychnine. Pour this over one-half bushel of wheat, stir very thoroughly, and spread to dry. Later stir in a cupful of melted tallow to waterproof it somewhat. This is a good keeping concoction that will poison twenty acres or so, a light scattering being all that is needed. It is best to re-

member that it is a poison. This is practically the same as the bait used in California to clean out the squirrels.

Mealy bugs are a great nuisance, especially in dry weather. The ants herd them like cows and keep a flock in reserve to replace losses. The way to have clean fruit is to use clean plants, and to spray, and spray. There are a lot of good sprays that concentrating round the stem of the plant injure it. Soap seems the best spray, all things considered. Ivory soap is good, and Fir tree oil soap. Good's Caustic Potash Whale Oil Soap No. 3 is the best I know anything about. Being a soft soap it is easily dissolved, the potash is a fertilizer and it can be laid down here in barrel lots at less than six cents a pound. Made by James Good, Front street, Philadelphia. Most dealers palm off a caustic soda whale oil soap on the buyer, which is not so good, though it is equally smelly and cheap. Most soap sprays need about one pound soap to seven or eight gallons of water for mealy bug work. Fir tree oil soap, costing about thirty cents a pound, and caustic potash whale oil soap are effective somewhat more diluted.

The most effective use of a spray requires pressure, more than can be got out of a knapsack sprayer. Otherwise the Deming Co.'s knapsack spray pump, which has a drip collection to protect the bearer's back, is a good machine. It needs a nozzle that sends the spray in a rather compact stream—a broad spray for this work is weak and wasteful. What is called the auto-pop nozzle is very good when altered a little, and it is saving in soap. Where possible I use a wheel barrel spraying machine that gives 100 pounds pressure. There are many so-called auto-spraying machines on the market. I have tried a number and never have seen a decent one. With these machines, you pump up pressure before spraying. The scale is easily controlled by soap. Vigorous plants suffer little from it.

DIVISION OF ANIMAL INDUSTRY.

Honolulu, Feb. 24, 1914.

To the Honorable the Board of Commissioners of Agriculture and Forestry.

Gentlemen:—Pertaining to the work of the Division of Animal Industry during the month of January, 1914, I have to say that I have been confined to my room for a considerable part of the time on account of sickness. Inspection of imported live stock as well as tuberculin testing has been carried on as usual by Dr. Case while I have devoted myself to my annual report and to the dog quarantine station, which I have managed to visit regularly. I would only call the Board's attention to the recommendations in my last reports as to the keeper's cottage and an additional small building for the safe keeping of fancy dogs. This I believe is essential. As may be seen from the enclosed corre-

spondence with Governor Pinkham every effort is being made to discredit or belittle the importance of the dog quarantine with a view to its abolition or at least modification to quarantine on the premises. So long as this feeling prevails it is necessary that every possible step be taken to guard the animals while in quarantine and it has been found necessary of late to have a man sleep in the dog enclosure every night.

That rabies is in no way abating on the mainland will be seen from the accompanying copy of the Hayward Journal (California) under the heading, "Mad Dog Bites Six People" (Jan. 27, 1914), and which is only one of many similar cases which have been reported to me recently. The dog in question bit not less than twenty other dogs and as a number of these undoubtedly were strays or ownerless dogs that will not be apprehended, some of them will in due time develop the disease and repeat the performance of the dog in Hayward. From the graphic description of this one outbreak it may easily be imagined what the introduction of a single infected dog into this community might mean.

Very respectfully,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, Jan. 31, 1914.

Dr. Victor A. Norgaard, Superintendent of Animal Industry.

Sir:—I have the honor to submit herewith my report for the month of January, 1914:

Tuberculosis Control.

The fifth annual tuberculin test of the dairy herds of the City and County of Honolulu was started this month and the following animals have been tested:

	T.	P.	C.
C. K. Quinn.....	3	2	1
W. E. Wall.....	1	1	0
Tom Quinn	3	3	0
P. M. Pond.....	129	125	4
P. M. Pond.....	308	307	1
F. S. Lyman.....	29	29	0
Waialae Dairy	231	221	10
Waialae Dairy	178	177	1
Waialae Dairy	3	3	0

This number makes a total of 885 head tested, out of which number 868 passed and 17 condemned and branded. Post mortem

examination on the heifer condemned at C. K. Quinn's dairy revealed generalized tuberculosis. Out of the five cows condemned at the Pond Dairy and which were killed at the Waipahu slaughterhouse, I was only able to make examinations on two, but in these two the disease was present in a generalized condition, which made the carcass unsafe for human consumption.

These two cows together with one which was killed the previous day were purchased by Mr. Pond from Mrs. C. M. White's dairy which, on two separate tests, had shown 50% of tuberculosis. The six cows, which formed the original purchase from Mrs. White, have now all been condemned and slaughtered.

Importations of Live Stock.

Jan. 5—S. S. Siberia, Orient: 1 black chow dog, J. Morton Riggs.

Jan. 10—S. S. Chiyo Maru, Orient: 28 crates pheasants, E. H. Paris.

Jan. 13—S. S. Lurline, San Francisco: 20 crates poultry.

Jan. 20—S. S. Wilhelmina, San Francisco: 14 crates poultry.

Jan. 26—S. S. Alaskan, Seattle: 11 horses, 13 mules, G. Schuman.

Jan. 28—S. S. Honolulan, San Francisco: 5 horses, D. Ferreira; 3 boxes monkeys, 5 boxes white mice, U. S. Exp. Station; 24 crates poultry.

Respectfully submitted,

L. N. CASE,

Assistant Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

Honolulu, Jan. 31, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the work of the Division of Entomology for the month of January, as follows:

During the month 29 vessels arrived at the Port of Honolulu, of which 27 carried vegetable matter and 2 moulding sand.

<i>Disposal</i>	<i>Lots</i>	<i>Parcels</i>
Passed as free from pests.....	963	22,098
Fumigated	14	1,144
Burned	102	128
Returned	2	2
Total inspected	1081	24,272

Of these shipments 24,005 packages arrived by freight, 117

packages by mail and 150 packages as baggage of passengers and immigrants.

Rice.

During the month 33,940 bags of rice arrived from Japan, all of which was found free from pests and was passed for delivery.

Pests Intercepted.

Ninety-one lots of fruit and 7 lots of vegetables were found in the baggage of passengers and immigrants from foreign countries and being prohibited from entry were seized and destroyed by burning.

One box of Chinese Pomelos arrived from the Coast on the Honolulan. This fruit was in the original package as shipped from Hong Kong, had found its way to the Coast, where it had been admitted, and then shipped here for Chinese New Year. As such fruit is prohibited from entry into the Islands it was seized and destroyed by burning.

A package containing sugar cane from Formosa was held for inspection at the U. S. Post Office. Under the new parcel post ruling the package was ordered returned to the shipper, for no plants or parts of plants can be shipped into the United States by parcels post from foreign countries. This ruling will also include bulbs and seeds.

In the grass packing about a shipment of plants from the Coast were found some ants (*Taminoma sessile*) and five species of beetles as yet undetermined. It is my opinion that these insects had taken refuge in the packing material during the cold, damp weather which prevailed on the Coast during the month.

Four baskets of sweet potatoes from Hong Kong were badly infested with the larvae of *Omphisa anastomosalis* and *Cylas formicarius*, two of the most common sweet potato pests. This was the worst lot of infested material I have ever seen, samples of which are in the Division Museum. In the same lot a colony of ants (*Prenolepis longicornis*) had established itself. The four baskets were first fumigated with Carbon bisulphide and then burned.

A box of seeds from Manila arrived by mail and contained a large colony of ants (*Prenolepis longicornis*). It is interesting to note that of the many species of ants which are found in all kinds of materials, not only in plant shipments but also in general cargo, very few species become established, despite the fact that well established colonies have been found during our inspection work, and no doubt previous to that must have been coming into the Territory. The small yellow house ant (*Monomorium pharaonis*) and the long horned black ant (*Prenolepis longicornis*), both found on these Islands, are also present on nearly every steamer as a pantry pest.

Hilo Inspection.

Brother Matthias Newell at Hilo reports the arrival of five steamers and two sailing vessels, the five steamers carried vegetable matter consisting of 122 lots and 2294 packages. One hundred sacks of potatoes had to be cleaned before delivery and some scabby ones rejected. Two cases of turnips and one of parsnips were so dirty that it was impossible to inspect them and they were returned to the Coast.

The T. K. K. steamer Anyo Maru arrived at Hilo direct from Japan during the month and brought 630 bags of rice, 588 bags of beans and 4 bags of sesame seed, all of which was passed as free from pests.

Inter-Island Inspection.

During the month of January 56 steamers plying between the Islands were attended to and the following shipments were inspected:

Passed as free from pests:

Plants	76	packages
Taro	1091	"
Vegetables	35	"
Fruit	12	"

Total 1214 "

Rejected on account of pests and soil:

Plants	9	packages
Fruit	13	"

Total 22 "

Respectfully submitted,

E. M. EHRLHORN,
Superintendent of Entomology.

DIVISION OF FORESTRY.

Honolulu, Jan. 31, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I have the honor to submit as follows the routine report of the Division of Forestry for the month of January, 1914:

Forest Fences.

The completion of two forest fences, built under contract for the Board at Moloaa, Kauai, and Makawao, Maui, may well re-

ceive first mention this month in that they are the initial fencing projects to be done under the new law giving the Division of Forestry the use of half of the revenues from water licenses.

The fence at Moloaa is on the boundary of the Moloaa Forest Reserve and continues other new fences required under Government leases of adjoining land. By means of them, with other fences already existing, the whole mauka section from the Anahola Ridge to Kalihiwai is now protected from cattle. As there are a number of small valleys carrying water in this reserve the effective protection of the slopes is a matter of no small importance. With the hillsides draining into these valleys protected it is reasonable to expect that more dependance can be placed on the streams as sources of local water supply. The fence at Makawao, Maui, encloses the area adjacent to the Waihou Spring, one of the very few permanent sources of water on the western slope of Mt. Haleakala.

On January 26, in response to a call for tenders, bids were received and opened for the construction of two more forest fences—respectively at Ninole, Kau, Hawaii, and at Lualualei, Oahu. The Ninole contract was awarded to Chas. H. Will of Hilo, the lowest bidder. All the tenders of the Lualualei job were rejected as being too high in cost. Other arrangements are, however, being perfected, under which it is expected that this latter fence will be built.

Several matters in connection with Government lands in the Honolulu Watershed Forest Reserve, Oahu, referred to me during the month, have received attention and will be reported on to the Board in the near future. With the regular routine work of the office the investigation of these questions has occupied most of my own time during the latter part of the month.

Forest Fire at Luakaha.

On January 26, a forest fire was reported in Nuuanu Valley, on Government land on a spur of the Pacific Heights ridge, just mauka of the C. M. Cooke place. It was discovered by Mr. L. A. Moore of the Waterworks Department, who began the fight. Chief Thurston of the Honolulu Fire Department sent a squad of men who worked hard to put the fire under control. David Haughs, with men from the Government Nursery, completed the work and stayed to patrol the area until all danger was past. I am indebted personally to Mr. J. C. Dort of the Division of Hydrography for taking me up to the fire on his motorcycle.

The area burned over is on a steep-sided ridge, that was covered below with dry grass, higher up with staghorn fern, and above with Koa trees and ie-ie vine. The fire was put out in the Koa grove, some trees being killed. About ten acres all told were burned over. It is not known how the fire started, but the evidence seems to point to a cigar or cigarette butt dropped by some-

one in the dry grass in a side gulch near the main stream at the foot of the ridge.

Work at the Nursery.

The routine report of the Forest Nurseryman, transmitted herewith, gives details in the matter of plant propagation and distribution and of the tree planting work now in progress on Mt. Sugar Loaf, Tantalus.

From the sub-nursery at Hilo Brother Matthias Newell reports the distribution of 1066 trees during 1913. He says, "The showing is not quite as good as the years before but this is owing to the fact that it is not always possible to fill demands for certain trees, there being not enough on hand." Now that the extension of the Hilo Railroad brings so much more country within easy reach of Hilo, this sub-nursery will doubtless have many more calls made upon it. Any homesteader or landowner in Hilo or Hamakua who desires trees can get them by making application to Brother Matthias Newell and paying the cost of transportation.

Congressional Seed.

A new lot of Congressional vegetable seed was received in January from the Delegate to Congress. As usual it is being distributed through the schools and to individual applicants. While it lasts packages will be sent to anyone who applies. There is this year no flower seed available for general distribution.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, Jan. 31, 1914.

R. S. Hosmer, Esq., Superintendent of Forestry.

Dear Sir:—I herewith submit a report of the principal work done during the month of January, 1914:

Nursery.

Distribution of Plants.

	In boxes transplanted	Pot grown	Total
Gratis	250	116	366
Sold	720	577	1297
	—	—	—
	970	693	1663

Collections.

Collections on account of plants sold amounted to.....\$ 4.40

Plantation Companies and Other Corporations.

The distribution of plants under this heading amounted to 9200 in seed boxes, 4500 in transplant boxes, and 1100 pot grown. Total 14,800.

Makiki Station.

An extra man was taken on at the beginning of the month, his work being to attend to the introduced plants which we are continually raising from seed received from foreign countries. The other two men have been doing regular routine work, namely mixing and sterilizing soil, transplanting trees, etc.

Honolulu Watershed Planting.

An extra man was taken on at the beginning of January, which makes five men altogether now employed. The number of trees planted during the month amounted to 1100, previously planted, 986. Total planted at the end of January 2086. Other work done consisted of clearing lines and making holes. The trees that have been planted are doing well and promise to make a rapid growth.

Very respectfully,

DAVID HAUGHES,
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

Honolulu, February 10, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the Division of Hydrography for the month of January, 1914, is submitted:

New Stations.

During the month of January twenty-three new stations were established and five were discontinued, as follows:

<i>Island</i>	<i>Established</i>	<i>Discontinued</i>
Kauai	1	3
Oahu	18	2
Mauī	4	0
Total	23	5

Of the above, the five stations established on Kauai and Maui are Stevens clock register stations, and the eighteen on Oahu staff gage stations.

The three stations discontinued on Kauai were ditch stations, which had served their purposes. The two stations discontinued on Oahu were on the Lulumaha and Pauoa streams. Three stations were not giving reliable results.

Reconnaissance Work on Oahu.

A considerable part of the month was spent in making les reconnaissance of the water serving valleys of windward Oahu. All streams from, and including the Honolulu basin, around the island counter-clock-wise as far as the Kahaluu valley are now under investigation. In addition to these, stations are being maintained on the Waiahole stream at a low level, and on the two branches of the Kaukonahua on leeward Oahu above all diversions.

Station sites have been selected on the streams in the Kahaluu, Waihee, Kaalaea, Waianu, Waikane, Kahana, and Punaluu valleys during the month. The Waiahole Tunnel project will pick up all of the low water discharge of the Waiahole, Waianu, Waikane and Kahana streams at an elevation of about 750 feet above sea level. At this elevation the streams are broken into many feeders, and the cost of establishing and maintaining a station on each stream above the proposed tunnel intakes would be excessive. The water company will probably maintain sufficient discharge measurement stations on the tunnel line to determine the amount diverted from each valley. The present station on the Waiahole and the proposed stations on the Waianu, Waikane, and Kahana streams below the tunnel line will determine the run-off from these valleys, which is not diverted.

Molokai Reconnaissance.

On February 10 C. T. Bailey and the undersigned will go to Molokai to make an extended reconnaissance of that island. The officials of the American Sugar Company of that island have agreed to provide all transportation facilities.

1913 Progress Report.

The assembling and computation work in connection with the 1913 Progress Report was about ninety per cent completed on January 31. The work has been somewhat retarded by the delayed receipt of field data from Kauai. The construction work on Kauai and Maui was not suspended during the month and interfered to some degree with the work of getting field data into this office.

1912 Progress Report.

On January 29 the galley proof of the 1912 Progress Report was received, and is now being proof-read in this office.

G. K. Larrison, Superintendent.

The entire month was spent on Oahu. One miscellaneous measurement was made, and les reconnaissance were made of the Kahaluu, Waihee, Kaalaea, Waianu, Waikane, Kahana, and Punaluu valleys with J. C. Dort, office engineer. Clock registers will be established on the Waikane, Kahana, and Punaluu streams in the month of March. The balance of the month was utilized on general administration work, computation and estimates pertaining to future construction, and the 1913 Progress Report.

J. C. Dort, Office Engineer, Oahu.

Mr. Dort visited four stream gaging stations and one rainfall station, spent 20 days in the office on the 1913 Progress Report and seven days in the field. He accompanied the superintendent on les reconnaissance of the Waianu, Waikane, Kahaluu, Waihee, Kaalaea, Kahana, and Punaluu valleys.

C. T. Bailey, Assistant Engineer, Maui.
H. Kimble, Assistant Engineer, Maui.

Mr. Bailey spent almost the entire month in collecting Maui data for the 1913 Progress Report, and working on the same in the Honolulu office.

Mr. Kimble spent the entire month on the construction of the new clock register stations in the Alo, Halawaliili, Halawanui, and Honopou streams on East Maui.

W. V. Hardy, Field Assistant, Kauai.
D. E. Horner, Field Assistant, Kauai.

Mr. Hardy spent the first part of the month on leeward Kauai collecting rainfall data, and collecting and preparing data for the 1913 Progress Report. The station on the Hanalei stream was completed during the latter part of the month. The construction work on the Kalihiwai station was also started.

Mr. Horner spent the entire month on construction on the Hanalei and Kalihiwai stations.

The heavy winds of the early part of the month did considerable damage by blocking trails with fallen trees.

Mr. Hardy spent 20 days in the field, and Mr. Horner 29 days. Thirteen stream measurements were made, and sixteen rain gages were visited.

H. A. R. Austin, Field Assistant, Oahu.

Mr. Austin spent 3½ days in the field and visited three stream gaging stations on one rainfall station. The balance of the month was spent in the Honolulu office on computations, map tracing, etc.

G. R. White, Field Assistant, Oahu.

Mr. White spent 18 days in the field, established 18 stations, constructed eight weirs, visited 19 stations, and made 29 measurements. The balance of the month was spent in the Honolulu office on computations, estimates, and general office work.

Very respectfully,

G. K. LARRISON,
Superintendent of Hydrography.

THE KALO IN HAWAII (VIII).

By VAUGHAN MACCAUGHEY and JOSEPH S. EMERSON.

THE WET-LAND CULTURE OF KALO (Concluded). FERTILIZERS.

All fertilizers should be applied before planting. Under most conditions the best fertilizer for upland or unirrigated taro is stable manure. The Hawaiians were familiar with the use of burnt bone as fertilizer, calling this material *pela*.

Mr. F. A. Clowes, with the Federal Station, finds that a rather liberal application of lime (1000 lbs. or more per acre) increases the yield and checks the rot disease. A satisfactory fertilizer for irrigated kalo consists of 300 lbs. ammonium sulphate, 450 lbs. superphosphate, and 400 lbs. sulphate of potash per acre.

Some very illuminating fertilizer tests with kalo have been carried on by the Federal Agricultural Experiment Station, and these are reported as follows:

* "In August, 1910, the station began some fertilizer tests on taro to determine the relative economic value of the use of fertilizers in various proportions and mixtures. These experiments were made in conjunction with the Kalihi Poi Factory and upon their taro plats. These experiments have been completed, and the data accumulated therefrom present some results of considerable practical value to taro growers, and in addition are of some scientific value.

"The field was divided up into seven plats, each approximately one-twentieth of an acre in area. The fertilizer was applied on

* Hawaii Agric. Expt. Sta. Ann. Rept. 1912.

August 5 and the taro planted on August 15. To plat No. 1 superphosphate and sulphate of potash were added; to No. 2, nitrate of soda, superphosphate, and sulphate of potash; to No. 3 no fertilizer was added; No. 4, ammonium sulphate, superphosphate, and sulphate of potash; and No. 5 received ammonium sulphate only. The same fertilizer was applied to plats 6 and 7 as to No. 4 except that in the case of No. 6 it was applied on September 16, just before planting, while on No. 7 it was applied two months after planting in order to determine if the time of application would cause any great variation in results.

"On August 29th the plants in plat No. 2 appeared to be about twice as large as the check plat; in plat 1 they were smaller, while in 4 and 5 they were about the same size as in the check plat. On September 12 the plants in plat 1 had assumed a yellowish color and were still smaller than those in the check plat. In plat 2 they were still larger than the check plat, but also very yellow. Plats 4 and 5 at this date showed great improvement, and the plants were larger than in any of the plats and of better color, No. 5 appearing especially green. The final results of the experiments are shown in detail in the following table:

EFFECT OF VARIOUS FERTILIZERS ON TARO.

No. of Plat.	Fertilizer Applied.	Amount per Acre. Pounds.	Yield of Taro. Pounds.	Yield of Poi. Pounds.	Pctge. of Poi in Taro.
1	{ Superphosphate..... Sulphate of potash.. }	{ 450 450 }	1499	1050	70.9
2	{ Nitrate of soda.... Superphosphate..... Sulphate of potash. }	{ 400 450 400 }	1751	1010	57.6
3	No fertilizer.....	...	1231	920	74.7
4	{ Ammonium sulphate Superphosphate..... Sulphate of potash. }	{ 300 450 400 }	1702	1270	74.6
5	Ammonium sulphate	300	1215	800	65.8

"These experiments, while they were carried through only one season, indicate the economic value to be derived from the application of ammonium sulphate, superphosphate, and sulphate of potash to taro. In the second column are shown the weights in pounds per acre, the plats used being only one-twentieth of an acre in size; hence only one-twentieth of these weights were applied on each plat. The yields of taro and poi are given in pounds per plat and not in acreage figures. The weight of taro does not include leaves, but only the marketable root bulbs. Column 5 represents figures obtained in factory.

"It is clearly evident from these results that the effect of nitrate of soda is to produce a bulb of greater weight and volume than any of the other fertilizers, but in so doing it causes a decrease in

carbohydrate content, from which some doubt arises as to its economic value as a fertilizer, even though it produced 90 pounds more poi than the check plat. The mixture used in plat No. 4, namely, ammonium sulphate, superphosphate and sulphate of potash, while it produced an increased yield of 350 pounds poi more than the check plat, does not produce an abnormal growth of the plant as in plat No. 2. This is shown by the fact that there is only 0.1 per cent. difference in the percentage of poi in taro obtained from this plat and the check plat, which indicates the normal development of carbohydrates in the root bulb, which results are to be desired in all fertilizer applications.

"The fact that taro is grown under soil conditions similar to those in which rice is grown suggests the possibility of these plants having the property of assimilating nitrogen in a somewhat similar form. It has been shown* that rice is unable to properly assimilate nitrogen when added in the form of nitrates, while, on the other hand, ammonium sulphate supplies the nitrogen in a form which produces a considerable increase in yields of both straw and grain. However, in the case of taro the nitrate produces a slightly larger root than the sulphate of ammonia, but less starch.

"Plats 6 and 7 showed practically no difference in yield, indicating that no difference results from delaying the application of the fertilizer for two months. Also, the yield of these plats was practically the same as that from plat No. 4."

PLANTING.

Before planting, the water is run off, leaving a soft muddy surface. Sometimes, after the bottom of the kalo patches has been pounded, soft, loose dirt is spread over the surface, preparatory to planting. This is called *mahelu*.

The *huli* are the cuttings that are used for the propagation of the taro. They are of three types—*huli makua*, *huli ohā*, and *huli pu'u*. *Huli* is a generic term for those portions of the kalo that are used in propagation.

The *huli makua* is made by slicing off the top of a mature corm, the slice bearing with it the crown of leaves. The petioles are cut some eight or twelve inches from the slice, leaving these long stubs (*lauṗa'e*) of the petioles attached to the slice. In the midst of these petioles are the young leaves, so that this type of *huli* is really a large terminal bud, with a portion of the starchy stem or corm attached. To insure growth, the *huli* should be cut with a thin slice of the corm attached. If it is cut off without this precaution, the *huli* rots in the ground and will not grow kalo. Such a carelessly-cut kalo top is called *huli omu'omu'o*, and is a re-

* Hawaii Sta. Bul. 24

proach to the planter. The *huli makua* is the part commonly planted by the Chinese taro raisers.

Concerning the *huli makua*, Mr. Clowes writes: "The percentage of *huli omu'omu'o** which produce blossoms as the first step in their growth after planting, is large. As the initial stages of growth have great influence on the future of the crop, it is probable that the energy lost by the *huli omu'omu'o* in producing these useless blossoms, lowers their value as seed. However, it is the generally accepted belief that vigorous *huli omu'omu'o* are fairly good seed. It is common and advisable practice, however, if the *huli omu'omu'o* has divided into two branches preparatory to blossoming, to remove the flower branch before planting. It is also a commendable practice, when the blossoms appear after the *hulis* are planted, to remove them. They are an excellent vegetable when boiled, and for thus purpose alone are worth picking."

The *huli ohá* are lateral cormlets or suckers that are produced at one side of the main corm, and bear crowns of leaves. There are frequently a number of these cormlets grouped around the central corm. The *huli ohá* produce flowers more rarely than do the *huli makua*. Mr. Clowes finds that "large *huli* from *ohá* are vigorous, and probably better than *makua* of the same size."

In a letter from Mr. Clowes (June 18, 1912), the following statement is made: "As to the following habits of the taro, it is my observation that the only *hulis* that produce inflorescence are the *makua hulis*. In an experiment on the Hilo Experiment Station plots, out of 1000 *ohás* planted, only two flowers were recorded, and I think that must be due to a mistake somewhere. The production of the inflorescence in the *makua hulis* was very profuse * * * It is my impression that every *makua* produces flowers. I do not think *orás* ever do so, but this point I intend to determine by accurate observation. Sometimes in the upland taro fields, near the time of maturity, inflorescence will occur. It is my impression that this is only on the *makua* part of the plot."

The *huli pu'u* are secondary lateral cormlets, too small to cook, and not yet producing leaves. The *pu'u* are the "grandchildren" of the parent corm, for they originate from the *ohá*, rather than from the *makua*. The *pu'u* are also called *weli*, *wá'e*, and *a'e*.

Ac, without the glottic closure, means the liquid or juice that can be wrung from the *kalo*, etc. *A'e*, with glottic closure, the lateral offspring of the second generation from the *kalo* corm by budding; also called *pu'u* or *huli pu'u*. These two words, *ac* and *a'e*, are absolutely distinct in etymology as well as meaning. The term *a'e* as applied to the secondary offspring of the *kalo* is only used with respect to upland *kalo*; *pu'u* is the word used with re-

* The name *huli omu'omu'o* is in some regions erroneously used as synonymous with *huli makua*.

spect to the same thing in wet-land kalo. A native from Molokai calls the juice from the kalo stem, *wale*. The same man calls the offspring of the second generation of the wet-land kalo, *wa'e*. These *huli pu'u* are very satisfactory for propagation, for although they grow at first more slowly than the *huli makua*, they ultimately grow more rapidly. This is due to the fact that in the *huli makua* only a small slice of the corm is left attached to the *huli*; while the *huli pu'u* possess entire corms. The *pu'u* are therefore the quickest of all, giving a crop, in many instances, within six months from planting.

TIME OF PLANTING.

There is considerable divergence of opinion among the present-day Hawaiians as to the best time for planting the *huli*. According to some, there are two periods in the course of the Hawaiian lunar month that are considered especially propitious for the planting of kalo—the nights of these two seasons are *hoku* and *mahe-alani*. These are during the first quarter, when the moon is waxing. Others designate three suitable occasions—the two above mentioned, and also a third period, *akua*. According to other reliable authorities, the *huli* may be planted at any season, irrespective of the condition of the moon. In this case, however, when the moon is full, the planter must go into the field or *lo'i*, and press the mud firmly around each *huli*, so that they are firm in the mud. This causes the corms to attain large size; if omitted, they will be small and stunted. These ideas are, of course, wholly superstitious.

METHOD OF PLANTING.

The *huli* are planted either in rows or in hills. The planting or thrusting of the *huli* into the mud is called *kanu huli*. *Kanu* is a general word, meaning to bury in the earth. Kalo growing in hills is called by various names, as *opu kalo*, *pu'e*, or *pu'c'pu'e*. Five or more *huli* are planted in a single hill. When *huli* are scarce, economy may compel the reduction of the *huli* in a hill to four. Ordinarily five or more, and sometimes, in an extra large hill, as many as ten or a dozen, or even twenty, may be planted.

Planting in hills was customary among the Hawaiians; planting in rows, because of the larger returns per acre, finds favor among the Chinese planters. Kalo planted too closely in hills or rows was called *pipipi* or *ku-pina'i*. Kalo recently planted is called *opc'-ape'a*. The evolving or unfurling of the leaf is called *mohala* or *mohola*; the first leaf to appear after the *huli* is planted is *lau atea*, and the first two leaves are *lau pa'i*. When *huli* are planted in rows, the rows are one to three feet apart, according to variety. Small temporary ditches containing water are commonly left between every five or six rows.

IRRIGATION.

The general water supply is not turned into the field until the plants are well rooted and the leaves have begun to unfold. If flooded too soon there is double danger—either that the plants will tip over, due to insufficient rootage, or that the tender plantlet will be attacked by root rot. Just before flooding, when the plants are three weeks to a month old, the patch is cultivated between the rows. The water is then turned in, and the field is kept continuously under water from this time until the time of harvesting.

It is highly important that the water be kept in continuous circulation. This checks the breeding of mosquitoes, and the development of root rot, and tends to produce a uniform stand. The inlet and outlet of the flowing water in each field should be arranged that the flow will be as uniform as possible over the entire area. A common yet most unscientific arrangement is one whereby the water flows across one side or one end of the patch and remains stagnant in the remainder. Under such conditions the stand will not be uniform, and there is great danger from root rot.

CULTIVATION.

During the first six months weeding is done. This is hand labor. The weeds and dead kalo leaves are trampled into the ground as fertilizer. After the first six months no more weeding is done, as there is liability of injuring the kalo. The corm remains comparatively small for a period of eight or ten months, the leaves being the rapidly growing portion of the plant during this period. Thriftily-growing kalo, full sized and good, was called *ai-ohaha*. During the last month or two the corm fills out rapidly, the other parts of the plant contributing their strength towards the growth of the corm. The vigorous and rank growth of the kalo leaves, preceding the maturity of the corm, was called *ohaha* or *ai ohaha*. The final development of the corm, which was marked by the cessation of growth in the leaves, was called *hachu*. These words are adjectives or adverbs, not substantives. Sometimes the young kalo plants were bent away from the old ones, in order to give all room to grow. This process was called *oha-kula'i*.

HARVESTING.

The growth of the kalo corm is quite different from that of such a root as carrot, which grows downward from the depth at which the seed is planted. The kalo corm is a true stem, and forms at a point not lower than the bottom of the *huli*. It then grows *upward*, and enlarges, the older leaves and roots gradually dying. The maturing of the corm can be recognized by the yel-

lowing and curling-up of the leaves (*ponalo*). The time required from planting to harvesting is from six to fifteen months, varying with the variety and the environment.

The harvesters go bare-footed in the patch, trample around the corms to loosen them from the mud, pull them by hand and toss them into piles along the embankments. The small refuse taro (*palili*) is thrown upon the side of the patch (*hoomahahá*). The general litter about the harvested field is called *la-cle*, and the empty field itself, with the young shoots remaining, is *aa'e* or *nanai*. On the embankments they cut off the leaves, and may throw them into the patch for fertilizer or carry them away for swine food. The *huli* are then sliced off, and piled nearby. These kalo tops are called *anihinihi* or *onihinihi*. When they are dry they are *la-cle*. The corms are carried away to be made into poi, or to be sold as vegetables. If the kalo is to be marketed as a vegetable, the *huli* are not cut off. Several corms are tied together, forming a bunch. A bunch of kalo corms is called *hui-hui-kalo*.

Mr. Clowes finds that for the best results not more than two crops of kalo should be taken from the land without planting to some other crop, such as bananas or a forage crop. A very satisfactory rotation scheme, practiced on the farm of the Hilo Boarding School, is as follows: First year, kalo; second year, sorghum, cow peas, pigeon peas, vegetables, etc.; third year, cow pasture; fourth year, kalo again. This system completely rids the fields of kalo rot.

DRY-LAND CULTIVATION.

The following explicit directions for the raising of dry-land, upland or unirrigated kalo have been condensed from a statement by Mr. Clowes, who has charge of the agricultural work at the Hilo Boarding School:

The land is plowed, covering any weeds, grass or crop-refuse that is on the land. "Hilo-grass" sod is excellent ground on which to plant taro, although it may follow any crop which has not depleted the humus content of the soil.

Plowing is followed by thorough harvesting. The disc and the drag-harrow are used by Mr. Clowes. At this stage lime is applied, in the form of either coral sand, slaked or quick lime. A month after plowing the sod should have become sufficiently decomposed to permit planting. A light application of stable manure and commercial fertilizer is made at this period.

The strip to be planted is again harrowed to mix the manure evenly through the soil. The furrows (from 40 to 48 inches apart, such as are made to plant sugar cane) are opened. Whenever possible, the rows are run the longest way of the field. The bottoms of these furrows are widened, with a hoe, to prevent the

soil on the ridges from falling in on the *huli*. For the same reason the tops of the ridges are flattened. The bottoms of the furrows are about six inches below the ground level. They are softened to a further depth of 3 to 6 inches with a hoe. Stable manure is sprinkled in the bottom of the furrow and mixed with the soil by means of a cultivator.

A boy passes along the furrows with an armful of *huli*, dropping them in pairs about one foot apart. The planter follows with a dibble, and "dibbles in" the *huli*, inserting the bottoms of the *huli* two or three inches under the ground. By pointing the *huli* to the north the sun is not so liable to injure them.

Planting is usually done after a rain, or during cloudy weather. It was formerly a common practice to spread grass, banana leaves, or any similar material on the hills or rows, to serve as manure and as a mulch. This process was known as *po'i-kalo*.

About a month after the *huli* are planted the field is hoed. As soon as the plants have developed two or three leaves, cultivation with a one-horse cultivator is begun. The cultivator frequently knocks lumps of dirt down upon the plants. Someone follows the cultivator and removes these clods. Cultivation needs to be frequent or else not at all. At the Hilo Boarding School the *kalo* fields are cultivated every week or ten days till the crop is nine months old. When cultivation is persisted in as frequently as this, roots do not form within the depth of soil stirred by the cultivator. No harm is caused by the cultivator. If the field remains uncultivated for three weeks or a month, the roots develop near the surface of the soil. In this case cultivation cuts off many roots and harms the crops.

If the field is cultivated frequently, and hoed about once a month, the weeds are easily kept in check. Small *kalo*, stunted by weeds, is called *kokole*. At each hoeing, in the earlier stages, some of the earth that the cultivator has banked around the plants is drawn back upon the ridge. By the time the *kalo* is five or six months old the ground is flat, and after this the cultivator is made narrower. At each hoeing a little soil is banked up around the taro. By the time the crop is nine months old (the exact time depending upon elevation above sea and similar factors), the *kalo* is on a slight ridge. Now the cultivation is stopped, and the weeding is confined to shallow hoeing and hand-pulling.

After the *kalo* begins to ripen it is left strictly alone. No harm results if the weeds do come in as the *kalo* foliage dies down. Weeds apparently prevent the hasty ripening of the crop. After pulling the *kalo*, the weeds are plowed under.

(To be Continued)

ALFALFA GROWING AT THE COLLEGE OF HAWAII FARM.

INTRODUCTION.

The Department of Agriculture of the College of Hawaii recognizes the importance of crop demonstration and farm practice as an aid to agricultural instruction. Consequently a systematic effort has been made to establish at the College Farm cultures of representative crops. Among the crops thus far grown none have served a more useful purpose, nor excited greater interest among students and visitors than have the Alfalfa plots.

In the fall of 1912 the Junior Class projected an extensive series of alfalfa experiments. An acre of suitable land was set aside for the purpose. This was sown to four standard varieties. Careful records were kept by all the students and much interesting data secured.

The paper that follows, "Alfalfa, A Promising Forage Crop for Hawaii," was submitted as a thesis as a partial requirement for the degree of Bachelor of Science in Agriculture by Mr. William H. Meinecke of the Class of 1913.

F. G. KRAUSS,
Professor of Agronomy, College of Hawaii.

ALFALFA.

Medicago sativa—I.

A Promising Forage Crop for Hawaii.

HISTORY AND DISTRIBUTION.

The alfalfa or lucerne plant is believed to be a native of the temperate regions of Western Asia, most likely the northwestern frontier of India and Media.

Though the records of its first domestication are vague, it was apparently well established in agriculture before the earliest records of Greek history; but whether it was first domesticated by the Persians (as the Greeks supposed) or was used earlier farther east it is not known. The uncertainty as to the identity of the wild species from which the cultivated one developed, added to the fact that the botanical name was first given to the domesticated plant and has never been associated with any wild species makes it even more difficult to trace its origin.

It was cultivated in China at a very early date and carried to Greece during the Persian Invasion of 490 B. C. and by

146 B. C.¹ (some say 470 B. C.²) it was well known to the Romans under the name "Herba Medica," which refers to its Persian or rather its Median origin, but does not explain whether it was brought by the Romans directly from Asia. The Romans rightly prized it as a forage crop and introduced it wherever they went. There is still a little uncertainty as to whether or not it is indigenous to northern Africa, and was carried eastward along the ancient caravan routes. However, it was undoubtedly cultivated there nearly or quite as early as in Italy and was one of the favorite plants of the Sahara oases, having been grown from time immemorial.

The Moorish invasion of northwestern Africa and Spain carried the plant and name into Spain—hence the Spanish name "alfalfa" or "alfacfacah"³, meaning "the best kind of fodder." (Another theory is that the name al-falfa⁴ was derived from the Spanish *al* and the Arabic "fazfazah" which means "a certain plant used for fodder.")

During the Middle Ages it was popularly known throughout France, Belgium, Germany and England as "lucerne" (luzerne, luserne, lucern), a name which was probably derived from a river valley in northern Italy.

During the exploration and colonization of America, the English and Western European colonists carried the plant and the name lucerne to Eastern North America, while the Spanish explorer Cortes carried it in 1519 under the name alfalfa to Mexico and South America. It did not reach Peru and Chile till somewhat later and was carried as far west as Utah by the Mormon pioneers in the middle of the nineteenth century.

It was tried in New England and the North Atlantic States 150 years before the Revolution and although Thos. Jefferson (1793) and others spoke highly of lucerne, it did not prosper because of the general lack of lime and the proper bacterial organisms in the soil and also because the people were not familiar with the peculiarities of the plant. On the other hand, it was well adapted to certain parts of Central and South America and the name alfalfa spread rapidly throughout those countries, and was carried northward by the Spanish settlers along the Pacific Coast to Southern California. After the discovery of gold in that state, it was introduced from Chile in 1853 or 1854 and again in 1873 to the San Joaquin Valley, where it has become the most important forage crop of the region.

The wonderful success of alfalfa in California caused a "revival of learning" in agriculture and in spite of the determined declarations of the eastern farmers that "alfalfa was all right for the west, but was of no use and could not grow well in the east,"

¹ U. S. D. A., B. P. I. Bul. 131.

² U. S. D. A., B. P. I. Bul. 150.

³ U. S. D. A., Bureau of Plant Industry, Bul. 131.

⁴ "Forage and Fiber Crops in America"—Hunt.

it spread quickly throughout the west and has recently reached the eastern states and is now cultivated there with success and profit.

In 1895 alfalfa was first brought to Hawaii from California by the Hon. D. P. R. Isenberg and planted with success at Waialae, Oahu.

At present, the plant has spread not only to all parts of America and the Mediterranean region, but to almost every country settled by the white race and where the conditions for its growth are favorable, and, within a comparatively few years, will probably become second only (if not first) to corn as a cultivated forage crop of the United States.

As already indicated, the common synonym of alfalfa is lucerne, but it should not be forgotten that there are many others,⁵ chief of which are Chilean clover, French lucerne, and Purple Medick.

BOTANICAL RELATIONSHIPS.

Alfalfa, being characterized by leaves of three leaflets, belongs to the tribe Trifolieae or clovers of the family Leguminosae or pod bearers.

According to Carl S. Scofield,⁶ "the prevalent botanical name *Medicago sativa* cannot properly be used for this plant," the correct name being *Medica sativa* (L.) Mill. However, since this was the only reference to any generic name other than *Medicago*, we shall merely pass over the matter at least for the present and cling to the best known name *Medicago sativa* (L.).

The following are the most important species of the genus *Medicago*:

I. *M. sativa* (L.) or common alfalfa flrs. purple, approaching violet, seedpod with 3 spirals (sometimes 2 or 1), stems erect, inclined to be 4 angled. Found in S. Asia, N. Africa and S. Europe. Northern limit, Kopal, S. W. Siberia. Now found in all parts of the world wherever the conditions are favorable.

II. *M. falcata* (L.) or yellow alfalfa flrs. uniformly yellow pods sickle shaped stems spreading to erect. Closely related to *M. sativa*. Considered resistant to alkali, endures severe droughts and cold-good pasture. Found growing 68° N, record min. temp. 67.8° C. Distribution wide over Europe and Asia. Western. $\frac{2}{3}$ of Siberia. Seed brought to U. S. in 1906.

III. *M. media* or sand lucerne. Regarded as a natural hybrid of *falcata* and *sativa* flrs. very pale yellow to green to violet. Example—"grim alfalfa." Sweden, Siberia, Russia, Hungary. Native in Volga region of E. Russia.

IV. *M. glutinosa* (Bieb) or Caucasian alfalfa. Closely related to *M. falcata* 1 of 21 species native to Caucasasia. Native

⁵ "Book of Alfalfa" Coburn.

⁶ U. S. D. Agric., B. P. L., Bul. 131

of Caucasian Mts. and Transcaucasia generally, especially Armenia.

V. *M. platy carpa*. Flrs. yellow. Pods large and flat. Stems hard and smooth, almost trailing. Central & S. C. Siberia.

VI. *M. ruthenica*. Flrs. yellow. Pods flat and oval, tapering toward both ends. Low growing type. Distribution, in general, north of *M. sativa* grows in dry, stony soils, almost pure sand. Lake Baikal, Siberia, to Pacific Ocean.

VII. *M. arborea* (L.). Large bright yellow flrs. Largest representative of genus *M.* Over 10 feet high. Native of Med. region of Europe, Asia and Africa. Mentioned in ancient Greek and Roman writers as "cytisis." Less productive, becomes woody too quickly. Value in hot dry places. Remarkable vigor of growth.

VIII. *M. radiata*. This plant is placed in the genus *Trigonella* by all recent botanists.⁷

GENERAL STRUCTURE OF *M. SATIVA*.

Roots. The alfalfa plant has a very strong, tough and deeply penetrating root system, descending five feet in six months and from ten to twenty feet or more where the conditions are favorable. It has been recorded that alfalfa roots penetrated 129 feet below the surface of a tunnel in Nevada. The tap root is usually less than one-half inch in diameter below the crown, though very old plants have reached the size of a man's ankle. The large secondary roots extend directly downward with a slight lateral tendency and bear numerous rootlets which in turn bear elongate oval root tubercles, sometimes appearing in large clusters.

However, it should be noted that in some of our shallow Hawaiian soils the typical tap roots are absent and in their places we find well developed branching roots which spread laterally rather than downward.

Stems. The young seedling has a single erect slightly hairy stem, but the older plant has a great number of stems arising from the large crown and clipped stems. There are generally 20 to 30 stems six to sixty inches tall (usually 18" to 30"), while solitary plants may have 150 to 200 stems and even more.

A plant seven months old of the common Utah variety grown on the College Farm had 308 stems by actual count, and the writer has seen a photograph⁸ of a six months old plant grown under irrigation at sixty feet below sea level in southern California which was a little less than eleven feet in height.

Alfalfa sometimes has underground stems,⁹ some of which may take root and produce new plants.

Leaves. The dark green leaves are pinnate, with three ovate-

⁷ U. S. D. Agric., B. P. I., Bul. 131.

⁸ "Book of Alfalfa"—F. F. Coburn.

⁹ U. S. D. Agric., B. P. I., Cir. 115.

oblong toothed leaflets, one-sixth to one-fourth of an inch in width. When the plant has reached maturity the leaves turn yellow, wilt, and drop off. This suggests the importance of harvesting the crop when in its prime, since the loss of a part of the leaves may represent the most valuable part of the fodder.

Inflorescence. Six to twelve, purple to violet colored flowers are borne in a short compact raceme, forming a headlike cluster at the tip of the branch, each individual flower being borne on a short, slender pedicel. The flowers are generally insect pollinated, but they may be self-pollinated. The many seeded pods are small, slightly hairy, and spirally coiled in two or three turns.

Seed. The light olive green to reddish brown colored seeds are nearly oval to distinctly kidney shaped and bear distinct but not prominent radicles which are about one-half the length of the seed.

There are from 200,000 to 240,000 or more seeds per pound and sixty pounds per bushel.

The seeds germinate in from 3 to 5 days (sometimes 10 days), and the standard of germination is 90 per cent. While seed two or three years old is considered as good as fresh, prime seed has lost only 2.5 per cent. in 10 years. According to the U. S. D. Agriculture¹⁰ ordinary alfalfa seed generally tests as follows:

1st year	93%	germination
2nd year	84%	"
3rd year	79%	"

Adulterations. Before planting the seed, even though its germination be very high, one should test it for purity, for alfalfa seed is sometimes adulterated with cheap clover seeds; the seeds of the worst weeds ever known to the alfalfa grower are also introduced in this way. A little precaution at the proper time may save a great deal of trouble and may even be the means of success instead of failure.

The weed seeds most liable to occur with those of alfalfa are the dodder (large and small), yellow trefoil, bur clover, black medic, curled dock, lambs' quarters, spreading amaranth, green foxtail, witch grass, sweet clover, wild mustard, and Russian thistle, the worst and most serious of which is the dodder.

This plant is parasitic and attaches itself to the alfalfa by means of suckers and twines around the plant till it "chokes it." The best way to destroy a stand of dodder is to plow the infested field before the dodder comes in to seed and plant some other crop for two or more years.

Varieties. Like all other crops, there are a large number of varieties and strains of alfalfa now recognized and being cultivated with varied success according to the geographical and climatic conditions.

¹⁰ Farmers' Bulletin 495

It seems that alfalfa plants fairly well adapted to certain conditions will not do well at all in others. For this reason it is well to discuss separately the principal features of the various standard varieties.

(To be continued.)

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(NOTE.—“The Kalo in Hawaii,” No. IX, was received too late for insertion in this number.)

DIVISION OF FORESTRY.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

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The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications
**SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207,
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EDW. M. EHRHORN,
Superintendent.

THE HAWAIIAN FORESTER *and* AGRICULTURIST

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"Root Borers and Other Grubs in West Indian Soils," by H. A. Ballou, entomologist of the Imperial department of agriculture for the West Indies, has been issued in the pamphlet series of that department. It is concise in its descriptions and illustrated with more than a score of figures.

An exchange tells of ironbark foliage destroyed by insects, the Lerp (*Psyllidac*), aphid-like insects which attack eucalyptus trees, suck up the sap and construct delicate shell-like coverings called "lerps," under which they grow, moult several times and then appear as minute four-winged insects, which lay the eggs noticed on the leaves, from which fresh broods soon hatch. Generally only temporary damage of the trees, during the season of prevalence, is caused by the insects. Minute chalcid wasps are parasites of the Lerp insects, checking their unlimited increase.

INTENSIVE FARMING.

Half a page of the Washington Herald was lately taken by an article to magnify intensive farming, the author being Truman G. Palmer, student and writer on agricultural subjects. It is in reply to an interview with Thomas Nixon Carver, of the federal Department of Agriculture, which held that "intensive farming is expensive farming." Referring to a statement by Mr. Carver that the 16,000 acres which had been said was formerly required to support an Indian and his family would now provide farms of 160 acres each for 100 white families, Mr. Palmer says that the "unrepealable law of nature" that drove the Indian out "is equally applicable when comparing the one family which 160 acres will support by 'extensive' agriculture and the four families it will support by applying 'intensive' agriculture." He argues at length that intensive farming will cheapen the cost of living to the consumer while yielding the farmer a greater revenue per acre. Further, Mr. Palmer gives definite instructions in a plan of rotation of crops, to show what he means by intensive farming. Instead of sowing four fields of 25 acres each to cereals annually, the intensive farmer sows three to grain, planting some root crop in the

fourth. This one he plows deeply after fertilizing it heavily, and having prepared his seed bed with care plants it to any kind of a hoed root crop. He cultivates and hoes it thoroughly during the early part of the season, thus killing off the weeds and other noxious growths. The following year a cereal follows the root crop, while one of the first three grain fields is devoted to root cultivation, precisely in the manner of the original field of such crop, and so on, the process being repeated from cycle to cycle of four years indefinitely.

In Hawaii, where land for general farming is exceeding scarce, there can be no question that intensive farming is the only kind for the homesteader and truck gardener.

THE SPINELESS CACTUS.

An Australian correspondent of the *Tropical Agriculturist* (Ceylon) says of the spineless cactus:

"This really wonderful plant is not yet much known and it would prove invaluable to stock owners and others, more especially in poor or dry districts, where vegetation of any kind is grown with difficulty. It is easily grown from the heavy leaves or slabs in any class of dry soil, and after the first year will yield according to conditions from 100 to 200 tons of succulent and nutritious fodder which can be fed to all kinds of stock and more especially dairy cattle. By analysis one ton thereof is equal in feeding value to three-fourths that of lucerne [alfalfa], which is the richest fodder plant grown. During the hot summer months this plant would be luxuriant, and being of a rich juicy nature would also greatly allay thirst and would therefore prove the salvation of stock owners. Some of the species yield 8 tons of well-flavored fruit per acre, which makes excellent jams and jellies, etc., and growers have made up to £160 [about \$800] per acre. The young fleshy leaves are a good and wholesome vegetable when fried like egg-plant or boiled as greens, etc., and they also make good pickles. This very useful plant should prove a very great boon to residents in the East Indies, as not only is it the heaviest yielding fruit and fodder plant yet known, but it will thrive where hardly any vegetation will exist and requires but little attention. Stock owners particularly would find it useful."

A bulletin of the agricultural department of Trinidad and Tobago gives an estimate of the profit in making paper from the megass furnished in cane sugar factories. It takes into account the cost of a paper mill—roughly \$100,000 for one of 40 or 50 tons of paper capacity per week—with interest thereon, repairs, depreciation and difference of value between coal and megass as

fuel for the sugar factory, and finds a profit of about \$6.50 per ton of megass converted into paper. It is premised that there should be a local demand for the unbleached wrapping and packing papers contemplated to be produced. Hawaii imports about a quarter of a million dollars' worth of paper not specified in the more expensive classes each year from the mainland, and probably a large portion of this "all other" item consists of the unbleached qualities in question. With a development of miscellaneous fruits trade, no doubt the demand for packing papers would greatly increase.

Last year Hawaii shipped to the U. S. mainland canned pineapples to the value of \$4,054,711 and pineapple juice to the value of \$106,510. In the same period its exports to foreign countries of all kinds amounted to \$989,730, as compared with \$532,666 in 1912, or an increase of nearly 86 per cent., much of which is due no doubt to the pineapple industry. To the United States the shipments of canned pines have nearly doubled in the past two years.

Rubber Day at the rubber and tropical products exhibitions in London has been fixed for June 24. Prince Arthur of Connaught will open the exhibitions, of which King George is the patron, and the Right Hon. Lewis Harcourt, M. P., secretary of state for the colonies, will deliver an address on the occasion. Nothing appears to be doing toward having Hawaii represented with its rubber and other tropical products in these exhibitions.

Entomologist Ehrhorn, in his report for February, relates a highly humorous incident occurring in the inspection of packages from Japan.

Official reports from the State of New York indicate that the regulation of dairies there, with regard both to tuberculosis control and general sanitation, is far behind the conditions achieved on this island of Oahu through the coöperation of the territorial and the municipal authorities. If Dr. Norgaard has his way, the conditions on all the islands will ere long equal those on Oahu.

DIVISION OF ANIMAL INDUSTRY.

Honolulu, March 16, 1914.

The Honorable the Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I regret to state that my health has continued highly unsatisfactory during the greater part of the past month, the swollen condition of my feet (dermal neuritis) compelling me to keep to my room unless important business during the absence of my assistant in the country made it imperative that I attend to it in person.

In spite of this I have given full time to the work of the division, a number of important reports having been received from various federal and state authorities, principal among which are the "Proceedings of the American Veterinary Medical Association" at its 50th anniversary meeting in New York last fall, and which contains a number of valuable papers on the eradication of bovine tuberculosis and its relation to tuberculosis among children.

It is also gratifying to learn that the intradermal tuberculin test, which we have now used here between three and four years, is finally gaining recognition and that several states have now adopted it for official tuberculosis work. California especially has given much thought and work to the problem and mentions the favorable results obtained in this Territory.

In regard to the susceptibility of children to bovine tuberculosis, it would now seem to be definitely settled that the danger to children from tuberculous milk is very great. Following the Tuberculosis Congress in Washington in 1908, where Prof. Koch again asserted his opposing views, Dr. Park, the director of the laboratories of the board of health, started to work on this subject, and has now demonstrated that in the city of New York upward of three hundred children die every single year from bovine infection—three hundred fatal cases occur each year in the single city of New York. Dr. Park estimates that this number amounts to about $12\frac{1}{2}$ per cent of all the fatal cases of tuberculosis in children, and adds, "Surely we need no better evidence than that to demand of us the protection of human beings against bovine tuberculosis."

Dr. Park has also collected figures from all parts of the world, and these are very interesting. He says: "In adults 787 cases have been examined, of which 777 show human infection and 10 show bovine infection. The conclusion is that, so far as we can judge, adults are probably fairly immune to bovine tuberculosis infection. Coming to children from five years of age to sixteen years of age, we have 153 cases, 117 of which were of human and 36 of bovine origin. Coming to children five years old and

under, we have 280 cases, 215 of which were human and 65 bovine, coming very close to the figures taken from clinical work in England, from which we get the best information on this subject, namely, that from about 23 to 25 per cent of the fatal cases of tuberculosis in children are due to bovine infection. And these figures do not include the numerous non-fatal cases which produce only more or less permanent and more or less severe deformities of the skeleton—hipjoint disease, psoas abscesses, enlarged glands of the neck, etc. When we come to take these into account it seems fairly evident that 30 per cent of the cases of tuberculous children are due to bovine infection." Another eminent authority, Dr. Stiles of Edinburgh, has come to the conclusion from clinical evidence that most of these cases of bone and joint tuberculosis were of bovine origin. Being called into consultation once he made a diagnosis of bovine tuberculosis in a child who was too far gone to be helped and died within a few days. The father said the infection could not be bovine as he kept his own cow, and she had been tuberculin tested. The cow was killed and found to be simply riddled with tuberculosis—a far advanced case, such as frequently fail to react to the test. The father was so impressed that he then and there gave a large sum of money for an investigation, the results of which have just been published, and some of which are interesting enough to be quoted here: "Seventy cases were examined, these being children most of which have not died. Forty-one of these showed the bovine bacillus, and 23 human; three showed both bovine and human bacilli. Sixty-seven of these cases were children twelve years or under, and three adults between 24 and 30 years. Forty-seven were children five years old or under and of these 32 were infected with the bovine bacillus and 15 with the human, a percentage of 68." Dr. Stiles goes on to say: "When we come to examine the family history of these cows, we find some very impressive facts. In 21 cases there was a family history of tuberculosis. Of these, 15 gave human cultures and 6 bovine. That is 71 per cent showed human infection, whereas, in the 52 cases where there was no family history of tuberculosis, 9 prove to be human and 43 bovine; in other words 83 per cent of these cases were due to bovine infection. The final conclusions to this very valuable contribution to our knowledge of the importance of the bovine tuberculous infection to children, are to the effect that "nobody can deny the great danger to human health from bovine tuberculosis." "It is a black spot on the reputation of our civilization at the present time, to permit this preventable disease to continue to reap a harvest of over one million deaths every single year. In the United States alone over 200,000 of our fellow citizens every year go down to their graves from a preventable disease."

I have taken the liberty to quote these figures at length for the reason that the local sanitary authorities, as well as the Anti-

Tuberculosis League of Hawaii, do not seem to realize the immense importance of this source of infection to human beings and especially to children. That there has been a decided decrease in the mortality from tuberculosis among children under five years of age in the district of Honolulu during the past year coincident with the elimination of the tuberculous cow from this same district, while at the same time infantile tuberculosis has been increasing in all other parts of the Territory, is admitted by the Anti-Tuberculosis League. It would therefore seem that no time should be lost in extending the bovine tuberculosis eradication to the other islands, especially as will be seen from the appended letter from the superintendent of the Anti-Tuberculosis League to the effect "that our records show infantile mortality from tuberculous meningitis and other forms of this disease to be far greater on Kauai than on any other island." This information has been communicated to the deputy Territorial Veterinarian on Kauai with a request for information in regard to the prevalence of bovine tuberculosis on that island and what steps are being taken for its suppression. As I expect to visit the island of Maui this coming week I shall look into conditions there with a view to inaugurating an active campaign against the tuberculous cow.

Dr. Fitzgerald reports that glanders has again made its appearance among a certain bunch of horses, through which one plantation mule became infected. By the speedy application of the intradermal mallein test to all exposed animals the infected ones were located and destroyed and it is believed that the outbreak has been suppressed. This matter will, however, have my personal attention, especially as this is the first opportunity to try the new ophthalmic mallein test which has been adopted by the federal Bureau of Animal Industry for use in inter-state shipments of horse stock.

The correspondence pertaining to both the outbreak on Maui and to the new test is herewith appended.

A number of inquiries have been received in regard to the continuation of the quarantine of hogs on the island of Oahu, to which I have replied that the embargo cannot safely be removed for some time yet.

Very respectfully,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, Feb. 31, 1914.

Dr. Victor A. Norgaard, Chief of Division of Animal Industry.

Sir:--I have the honor to report as follows for the month of February:

Tuberculosis Control.

The following herds have been subjected to the intra-dermal tuberculin test:

	T.	P.	C.
Charles Lucas	82	80	2
T. F. Farm.....	40	35	5
F. Medeiros	21	21	0
P. Miyakawo	15	15	0
K. Inouye	17	17	0

The total number injected is 175, out of which 168 have been passed and 7 condemned and branded. It was surprising and also discouraging that five cows were condemned at Farm's dairy, but considering the fact that Mr. Farm has never followed our instructions in regard to disinfecting after each test the result could not have been otherwise. He now intends to remove all the old feed boxes, replacing them with new ones and give his barn a complete and thorough disinfection.

Importation of Live Stock.

- Feb. 2—S. S. Sierra, San Francisco. 4 crates poultry.
 Feb. 2—S. S. Matsonia, San Francisco: 16 crates poultry; 1 dog, Mrs. J. M. Senni.
 Feb. 4—S. S. Missourian, Seattle: 17 horses; 200 hogs (slaughter), 77 hogs (breeding), 5 crates poultry, A. L. McPherson.
 Feb. 6—S. S. Tenyo Maru, Orient: 6 crates pheasants, E. H. Paris.
 Feb. 9—S. S. China, San Francisco: 1 dog, Wells Fargo Ex. Co.
 Feb. 16—S. S. Ventura, San Francisco: 7 crates poultry; 1 dog, Nellie Adams.
 Feb. 16—S. S. Mongolia, Orient: 1 dog, J. C. Collins.
 Feb. 17—S. S. Wilhelmina, San Francisco: 29 crates poultry.
 Feb. 20—S. S. Sonoma, Sydney: 1 cat, Mrs. C. D. Thomas.
 Feb. 24—S. S. Honolulan, San Francisco: 2 Shorthorn bulls, Antonio Perry; 7 crates poultry.
 Feb. 26—S. S. Niagara, Vancouver: 1 dog, Mr. Payne.

Respectfully submitted,

L. N. CASE,
 Assistant Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

Honolulu, Feb. 28, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the Division of Entomology work for the month of February, 1914, as follows:

During the month 34 vessels arrived at the port of Honolulu, of which 24 carried vegetable matter.

<i>Disposal</i>	<i>Lots</i>	<i>Parcels</i>
Passed as free from pests.....	683	15,276
Fumigated	1	27
Burned	41	43
Returned	4	42
Total inspected	729	15,388

Of these shipments 15,186 packages arrived by freight, 124 packages by mail and 78 packages as baggage of passengers and immigrants.

Rice Shipments.

During the month 18,005 bags of rice and 1721 bags of beans arrived from Japan and being found free from pests were passed for delivery.

Pests Intercepted.

Thirty-three packages of fruit and 4 packages of vegetables were found in the baggage of passengers and immigrants from foreign countries, all of which, being prohibited from entry, was seized and destroyed by burning.

One lot of orchids from Costa Rica, Central America, came by local boats and in the packing were found a few Tenebrionid beetles and some ants. These plants were fumigated and the packing destroyed. A permit from the federal horticultural board accompanied the shipment.

Two cases of apples were returned to the storeroom of the transport Sherman, having been found infested with Codlingmoth.

Thirty-eight sacks of potatoes arrived from Sydney, Australia, and under a ruling of the federal horticultural board of the United States Department of Agriculture could not enter the Territory on account of not having the required permit and the shipment remained on board of the S. S. Marama.

Probably the most remarkable seizure ever made by the division took place in the postoffice. A package of twigs from Japan was held for our inspection and on opening the same the inspector

found tree twigs which were hollow, each opening plugged up with twisted grass. A closer examination disclosed the fact that each twig contained a good, fat, live borer. A letter was enclosed in the packages and the same, after having been translated, told the following story:

"Greetings: This time I am sending you some medicine, good for consumption. Open the twigs and you will find a worm (*Sabutori-mushi*) in each twig. Take out one and wrap it in sembi or ame and swallow it alive. The juice of the living worm is good for the disease. However, if the worms are dead, you can bake them until black and powder them up and drink it with sake. Those I send will constitute a dose for one week. When you take the worms please inform me if you digest the same. If you should find any such worms in Hawaii, continue taking same for some time," etc., etc.

The worms found in the twigs represent two distinct orders of insect. Some were the grubs of a large stem-boring beetle belonging to the *Cerambycidae*; the others the larvae of some stem-boring moth. The package was seized and the contents are now the property of the board museum, as alcoholic specimens. This illustrates another channel through which some serious pest might enter the Territory. Worm diet for the cure of the white plague might be all right in Japan but we have not as yet heard of this method being used here and we surely shall not allow a trial with imported borers such as were found in the mail package.

Hilo Inspection.

Brother Matthias Newell at Hilo reports the arrival of 7 steamers, all of which brought vegetable matter consisting of 91 lots and 1962 packages. Three sacks of turnips had to be cleaned of earth and 39 bags of potatoes were too scabby to land and as no one wanted to pay for the return freight, they were dumped at sea.

Inter-Island Inspection.

During the month of February 52 steamers plying between the islands were attended to and the following shipments were inspected and passed:

Plants	78 packages
Taro	960 bags
Fruit	18 packages
Vegetables	42 "

Total passed 1098 packages

The following packages were refused shipment on account of

being either infested with pests or having soil attached to the roots:

Plants	16	packages
Fruit	8	"
Vegetables	2	"
<hr/>		
Total refused	26	"

Respectfully submitted,

E. M. EHRLHORN,
Superintendent of Entomology.

DIVISION OF FORESTRY.

Honolulu, Feb. 28, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I have the honor to submit as follows, the routine report of the Division of Forestry for February, 1914:

Forest Reserves.

On February 12 a public hearing was held by Governor Pinkham and the Board of Agriculture and Forestry to consider the setting apart as an addition to the Kaipapau forest reserve, of a part of the land of Hauula, and as a new forest reserve, of the upper portion of Kuliouou valley, both on Oahu. Objection being made by certain of the Hauula homesteaders to the location of the proposed makai boundary, Governor Pinkham postponed action by taking the matter under advisement. There being no objection to the reservation of Kuliouou, the Governor, on February 13, signed a proclamation officially setting this land apart. The area is 214 acres. It is the thirty-fifth forest reserve to be made in the Territory of Hawaii and brings the total area in the system up to 787,083 acres, of which 69 per cent., 541,091 acres, is government land.

Forest Fences.

Early in February I made a quick trip to Kauai to inspect the recently completed forest fence on the boundary of the Moloaa reserve and to make further arrangements in connection with the building of another fence on the government land of Wailua, mauka of Lihue. On February 20, Mr. A. M. Brown notified me of the completion of the fence on the Kula forest reserve boundary, Maui, required to be built under leases held by the

Cornwell Ranch. Mr. Brown further said that the tree planting called for under the same leases was going forward satisfactorily, the number of trees in the ground being up to the requirement for this time.

Considerable preliminary work was done during the month on other fence projects which will be reported on to the Board in the near future.

Special Reports.

Toward the end of the month several letters and brief reports were got ready containing recommendations on forest matters that had recently been referred to me for investigation. Also during February I prepared for the use of the Board a short report covering the routine work of the Division of Forestry for the calendar year, 1913.

Tree Planting and Seedling Distribution.

Good progress is being made in the tree planting on the slopes of Sugar Loaf, above Makiki valley, Honolulu, and recently the Division of Forestry has succeeded in making better provision for supplying seedling trees to homesteaders in several newly opened tracts in different parts of the Territory. Mr. Haugh's report, transmitted herewith as usual, gives additional facts and figures.

Forest Fire Service.

Owing to removal from Maui, Mr. A. K. Jones resigned early in February as district fire warden for Kahikinui and Honuaula, Maui. His resignation was accepted at a meeting of the Board held on February 26, 1914. No one has as yet been appointed in his stead.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, February 28, 1914.

R. S. Hosmer, Esq., Superintendent of Forestry.

Dear Sir:—Herewith I submit a report of the principal work done during the month of February, 1914;

*Nursery.**Distribution of Plants.*

	In Boxes Transplanted.	Pot Grown.	Total.
Sold .....	...	38	38
Gratis	250	2314	2564
	<hr/> 250	<hr/> 2352	<hr/> 2602

Collections.

On account of plants sold.....	\$1.20
On account of seed sold.....	8.00
Total	<hr/> \$9.20

Plantation Companies and Other Corporations.

During the month we distributed 5500 seedlings in seed boxes, 400 in transplant boxes and 500 pot grown. Total, 6400. The species consisted of eucalyptus and casuarina.

Experiment Garden, Makiki.

The principal work done at this station during the month consisted of transplanting seedlings, mixing and sterilizing soil and doing other routine work.

Honolulu Watershed Planting.

Three extra men were engaged and started work on February 16th, making a gang of eight men altogether. Trees to the number of 458 were planted out. Other work done consisted of clearing off and making holes. The total number of trees planted on Sugar Loaf up to the end of February amounted to 2544, all of which are koa.

Very respectfully,

DAVID HAUGHS,
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

Honolulu, March 10, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the Division of Hydrography during February, 1914, is submitted:

DROUGHT.

The rainfall during February was generally very light, with the result that all streams are very low. While all reports from other islands have not been received, indications point to the driest February in a long period of years. All streams on Oahu are at the lowest discharge recorded in the past three years.

Should the 1914 summer season follow its usual regime, indications point to a great shortage of water, and water users should plan for such a condition.

SERVICE RECORDS.

Daily service records of each employe are filed in the Honolulu office, and are available for inspection. The records show the location and services performed by the employe.

G. K. Larrison, Superintendent.

Twelve days were spent in the field, including a reconnaissance of Molokai from February 11 to 18. Further reconnaissance was made of the Haiku, Kahana, and Punaluu valleys, on Oahu, with H. Kimble, Assistant Engineer, who will begin the construction of clock register stations on these streams, March 4. The rest of the month was spent on estimates, computations, and general supervision work.

J. C. Dort, Office Engineer, Oahu.

Five and one-half days were spent in the office, 31 stream-gaging stations and one rain-gaging station were visited, and two stream measurements made. The greater part of the month was spent on computation and compilation work in connection with the 1913 Progress Report.

C. T. Bailey, Assistant Engineer, Maui.

Twenty-five days were spent in the field, including a reconnaissance of Molokai from February 11 to 18 with the Superintendent. Nine stream-gaging stations were visited on Maui, and

eight measurements were made. Two and one-half days were spent on an investigation of the water supply of Wailuku.

H. Kimble, Assistant Engineer, Kona and Oahu.

February 6 to 13 were spent on the special Kona investigation in measuring the capacity of one of the typical water holes in South Kona. At the time the field work of this investigation was being made, wet weather conditions prohibited the measuring of the capacities of the typical water holes of Kona. This work was consequently postponed until dry weather was reported.

Mr. Kimble spent three days on Maui on construction work on the new clock register station on the Halawaliilii Stream. The last five days of the month were spent on stream gaging and construction work on Oahu.

W. V. Hardy, Field Assistant, Kauai.

D. E. Horner, Field Assistant, Kauai.

Mr. Hardy spent the greater part of the month collecting, checking, and copying Kauai rainfall and run-off data for the 1913 Progress Report. The Stevens clock register station on the Kalihiwai River was completed—all except installing the register on its pedestal. This will require about one-half day's time. Construction on the new trail from Lumahai to the new station site (about five miles long) was started. Mr. Hardy spent ten and one-half days in the field, visited ten stream-gaging stations, and made one stream measurement.

Mr. Horner spent all 28 days in the field, visited seven stream-gaging stations, and six mountain rainfall stations. Fourteen days were spent on the construction of the Kalihiwai Station.

H. A. R. Austin, Field Assistant, Oahu.

Eighteen days were spent in the office on computations, checking, etc., and four days in the field. Twenty-one stream-gaging stations and three rainfall stations were visited.

G. R. White, Field Assistant, Oahu and Maui.

Nine days were spent in the field on Oahu, and four days on Maui. Thirty-five stream-gaging stations were visited, and twenty-four stream measurements were made.

1913 PROGRESS REPORT.

All original data for the 1913 progress report are complete, and blue prints are being made preliminary to sending the original

data to the Washington office for publication. The services of Mrs. Dort and Mrs. Kennedy, who were employed in this work during the month, were dispensed with on February 28.

SUMMARY OF STREAM-GAGING STATIONS FOR MONTH.

Island.	At End of Month.	Est'd During Month.	Discont'd During Month.
Kauai	31	0	0
Oahu	40	2	0
Maui	43	0	0
Hawaii*	1	0	0
Total	115	2	0

Very respectfully,

G. K. LARRISON,
Superintendent of Hydrography.

KULIOUOU FOREST RESERVE.

On February 12, 1914, a public hearing was held by the Governor of the Territory of Hawaii and the Board of Commissioners of Agriculture and Forestry to consider the setting apart as a forest reserve of a small area of forest land at the east end of Oahu, near Koko Head. The tract is the upper portion of the half of Kuliouou valley owned by the government, 214 acres.

The purpose of creating this land a forest reserve is to afford better protection to the small stream that flows down the valley and waters the dry lower lands. No opposition developing to the project, Governor Pinkham on February 13 signed a proclamation officially setting the land apart. This is the first forest reserve to be made by him, the thirty-fifth in Hawaii.

Following is the report of the Superintendent of Forestry on Kuliouou. Elsewhere in this issue of the Forester appears the proclamation:

Report of the Superintendent of Forestry.

Honolulu, Nov. 12, 1913.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I have the honor to recommend the setting apart as a forest reserve of the mauka section of the government land of Kuliouou in the Honolulu district, Island of Oahu.

Kuliouou is a small, detached government land at the east end

* Kona investigation station.

of this island. It comprises the east half of the valley of the same name, the remainder being in fee simple ownership, and now under the control of Judge Frank Andrade. The makai portion of Kuliouou was cut up into beach lots and disposed of something over a year ago. An area of grazing land, 173 acres, above these lots and running up to the line of the proposed forest reserve, was leased on November 8, 1913, to Mr. Andrade. This lease carries a provision that a fence must be built on the forest reserve boundary within one year.

The section now proposed to be set apart is the mauka end of the valley, an area of 214 acres. The line was determined after a personal visit made to the tract, when I was accompanied by Mr. W. E. Wall, the government surveyor.

The object of the proposed reserve is to protect the stream that runs intermittently in the upper portion of the Kuliouou valley. Water is said to be found in pools much of the time, above the reserve line. Below, the stream bed is dry, except during rains. With a dense forest cover restored there is good reason to think that this source of water could be made a much more dependable, though limited supply.

Efficiently to protect the valley of Kuliouou will require the coöperation of the owner of the west, or fee simple half. From conversations had with Mr. Andrade on this matter I believe it will be possible to effect this. A comparatively short stretch of fence across the fee simple land, from the end of the required government fence to a pali, would block cattle from getting mauka.

There are said to be goats on the ridge above Kuliouou, that work over from the adjoining fee simple land of Maunualua, on the east. Just how much damage they are doing I am not in a position to say.

Between Kuliouou and the east end of the Honolulu Watershed forest reserve, at Palolo, is a stretch of privately owned land, in part belonging to the Bishop Estate. On a good part of it provision has been made by the owners for forest protection. While part of this fee simple area is thus being treated as a forest reserve it has for various reasons not been considered advisable to include it in the present project. The Kuliouou forest reserve as proposed includes only the above described piece of unleased government land.

Accompanying this report is the official technical description of boundary, prepared by the Government Survey Office as C. S. F. No. 2363.

For the reasons set forth above I do now recommend that the Board approve the creation of the Kuliouou forest reserve and call upon the Governor of the Territory to cause the land to be so set apart.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

ALFALFA—A PROMISING FORAGE CROP FOR
HAWAII.

By WILLIAM H. MEINECKE, Class of 1913.

(Continued.)

1. *Chilian or common or California alfalfa.*

The common alfalfa is distributed practically throughout North and South America and Hawaii, and is especially adapted to those sections of Southern California and the Western States, and also Hawaii, where the climate is mild and where there is a fair amount of rainfall or irrigation water. While it does fairly well in dry regions, it is best suited to those places where the water table is fairly high, and will respond wonderfully to proper irrigation. It can withstand fairly severe winters, but it is not considered the best variety for the northern conditions.

The many strains of this variety are commonly known by the name of the state or region from which the seed is obtained, e. g., Utah, California, Kansas, etc.

2. *Arabian alfalfa* (*M. sativa arabianica*).

As the name indicates, this variety was discovered in Arabia and was imported directly into the United States in 1902, and the first seed planted in Hawaii was obtained directly from Washington, D. C.

This variety is readily recognized by its thick succulent stems and large dark green hairy leaves. It is a very rapid grower and recovers quickly after cutting, the crop maturing within three weeks and in general one to two weeks earlier than the common variety. It cannot withstand frost or drought and is generally more susceptible to plant diseases than the other varieties, but will do very well in humid regions or where irrigation water is abundant.

3. *Turkestan alfalfa.*

Turkestan alfalfa was imported into the United States in 1898 and brought to Hawaii within the last decade. This variety is considered more resistant to cold and drought than the Chilian and has proven in South Dakota¹ to be more drought and cold resistant than Grim's alfalfa, but in North Dakota², with the temperature at 35° F. (1906-7), fifteen percent of the Turkestan plants were winter killed against five percent of those of the Grim

¹ U. S. D. A., B. P. I. Bul. 196.

² U. S. D. A., B. P. I. Bul. 185.

variety. (The intense cold was accompanied by a heavy snow-fall, which undoubtedly saved most of the plants.)

During the tests made by the Hawaii Station in 1910-11, this variety did not yield as much seed or fodder as the Chilean and Arabian, but it may prove valuable in some other parts of the Territory where the conditions are warmer and dryer. It may be also interesting to note that the Turkestan "is decidedly inferior in the humid sections of the Mississippi River, but has given somewhat better results than the ordinary alfalfa in the semiarid portion of the great Plains and in the Columbia Basin."³

4. *Australian alfalfa.*

The so-called Australian variety is probably a strain of the Chilean, which has been grown in Australia. Its foliage is somewhat darker and slightly more dense and fine than the latter, but from all practical standpoints it is the same.

The College of Hawaii has a plot of an eighth of an acre planted to this strain, but it has not proven to be quite as productive as either the Utah or the Kansas strain.

5. *Peruvian alfalfa.*

Peruvian alfalfa is very much like the Arabian in its lack of ability to withstand cold and drought. It is more woody than the latter and has proved to be inferior to other varieties in the North Western States, but is highly recommended by the Department of Agriculture⁴ for the Southwest.

It has been planted at the Hawaii Station, but no reports as to its merits have been published.

6. *Ecuador alfalfa.*⁵

The Ecuador variety originated in the mountains at about 9000 feet elevation. It starts a little slower than other varieties, but soon maintains a fast, steady, vigorous, erect growth. It is quite profusely covered with hairs and is readily distinguished by its very dark green color. The stems are coarser and more rigid than usual. It seems to be more woody than most of the others, with a less amount of foliage, and withstands well the changes in temperature but does not yield as well as the others.

7. *Tripoli or Algerian and Oasis.*

The Tripoli or Algerian and Oasis varieties are not easily winter killed, but grow very slowly and are of a pale, sickly color,

³ Farmers' Bulletin 339.

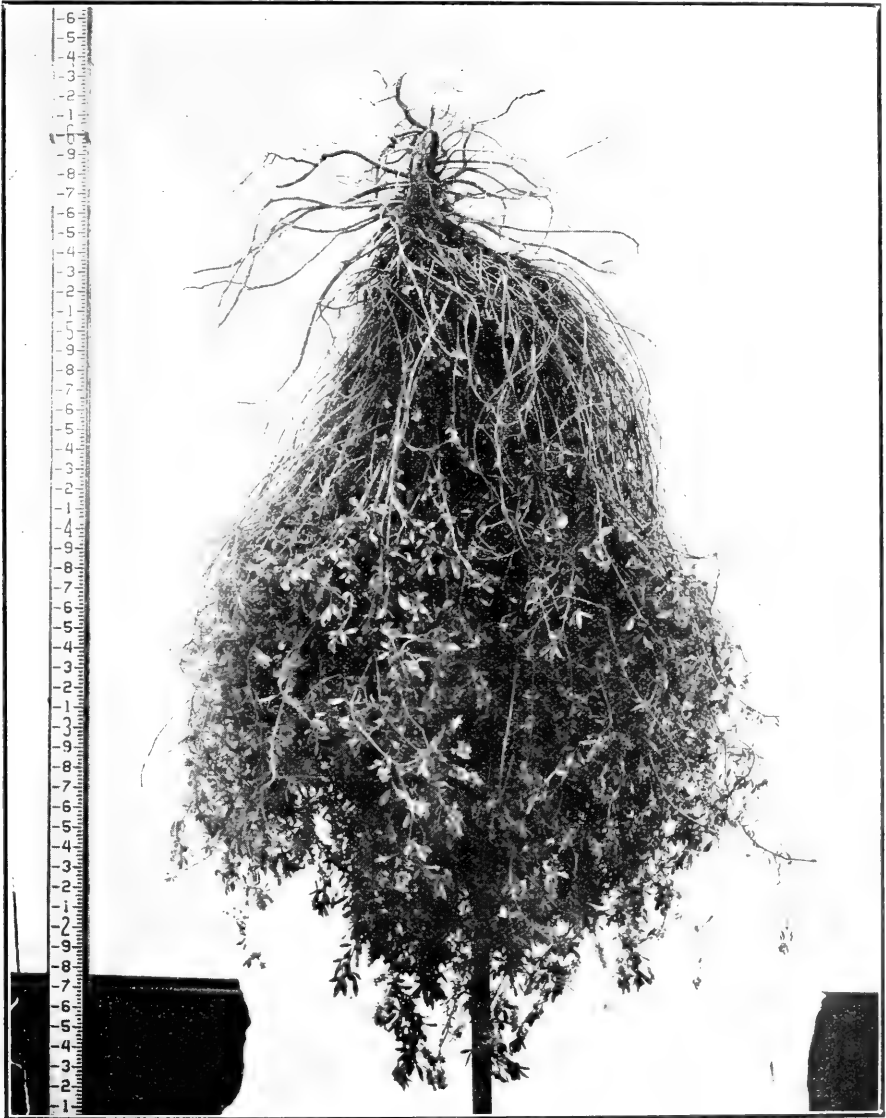
⁴ Nev. Sta. Report 1909.

⁵ Nev. Sta. Report 1909.

indicating their inadaptability to the climate of the United States, especially that of the West.

8. *French or sand lucerne.*

French or sand lucerne has very pale purple flowers, some of them almost white. It is said to be a different species of alfalfa



Typical breeding plant of Alfalfa one year old (grown on shallow ground).

(*M. media*), but it is also believed to be a natural hybrid of *M. sativa* and *M. falcata*. It yielded well in Utah, Colorado, and Nebraska, but did not do very well in Nevada and Texas. There are numerous strains of this variety, chief of which are the German, Baltic, and the famous Grim's alfalfa.

The latter is one of the most hardy of all alfalfas. It will not only withstand intense cold and drought but will do well on poorer soils than do others, its chief drawback being its tendency to lodge.

9. *German strain.*

A German strain of *M. medica* grown by Mr. Isenberg at Waialae, Oahu, proved to succeed much better than the common alfalfa. It is now exclusively grown there.

10. *Grim's alfalfa.*

Grim's alfalfa was originated by Mr. Grim of North Dakota. It is a close second if not a better variety than the Turkestan in the matter of resistance to cold and drought and has out-yielded it in several trials made in South Dakota. It is generally considered to be better adapted to northern conditions than to the southern.

11. *Baltic alfalfa.*

Baltic alfalfa originated in Baltic, South Dakota, and is believed to be a strain of Grim's.⁶ It resembles the latter very closely, is free from a bacterial disease common to all others, and is not so liable to lodge as the other strains of *M. media*.

So far as the writer can determine, only the following varieties have been grown in Hawaii thus far. They apparently succeed best in the order given:

- | | |
|------------------------|-------------|
| 1 Utah (Chilian) | 5 German |
| 2 California (Chilian) | 6 Arabian |
| 3 Kansas (Chilian) | 7 Turkestan |
| 4 Australian (Chilian) | 8 Peruvian |

Semipalatinsk Alfalfa. Since the above was written a new dry-land alfalfa (Semipalatinsk Alfalfa) has been introduced to the Islands by Messrs. H. Hackfeld & Co., through the efforts of their manager, Mr. J. F. C. Hagens. This seed was collected in Siberia in 1913 by Prof. N. E. Hansen of the South Dakota College of Agriculture. Of it, Prof. Hansen says:

"The seeds were gathered upon my fourth expedition to Siberia on the dry, open steppes near Semipalatinsk, Southern Siberia. This is a region with a total annual precipitation of eight inches, including both rain and snow, and with a temperature range of from 106 degrees in summer to 50 degrees below zero Fahrenheit in winter, often without snow. The expedition was authorized by the South Dakota State Legislature, March, 1913. My opinion is that they will be a great help to agriculture on the highest and driest uplands of a number of our western States where no irrigation is possible."

It is hoped that this variety may prove useful for our dry uplands. We understand that the seed is being rather widely distributed over the group and that extensive plantings are to be made on the Island of Lanai. F. G. K.

CONDITIONS AFFECTING SUCCESS WITH ALFALFA.

1. *Climate and Soil.* Alfalfa is naturally adapted to a warm climate; in deep soils it is highly drought resistant, but is also well adapted to irrigation. In general it does not endure very severe winters and an excess of rainfall or irrigation is decidedly injurious. Regardless of its nature the soil must be well drained or the crop will fail, as alfalfa is a plant which cannot stand "wet feet."

It succeeds best on a neutral soil, and will adapt itself to an alkaline soil, but is an absolute failure where there is more or less acidity or "sourness." A clean, deep and well drained, light, loamy soil is best, but heavy clay soils may be so modified as to yield profitable crops, provided they are not permitted to become water-logged and sour. Calcareous soils in humid regions are very good, and even the chocolate colored river bottoms and maize and oat lands are well adapted to alfalfa.

Another essential for success with alfalfa is the presence of specific nitrifying bacteria in the soil and a fair amount of humus, since humus is necessary for the best growth of bacteria and the plants can not do well without their presence. The lack of these bacteria in the soils of the Eastern States in the early days has proved to be the principal source of failure of alfalfa or rather lucerne as it was then called.

2. *Treatment of the Soil.* Alfalfa is not stoloniferous and poliferation is so very rare that it practically cannot spread, and especially when young is unable to choke out other plants as do the grasses. It is therefore very essential not only to plow deeply in order to allow the long roots to penetrate deeply, but also to cultivate in such a way that the land will be practically free from weed seeds and in very good tilth before the seeds are sown.

If the land is lacking in lime, it should be *applied before plowing* at the rate of from one-half to one ton of burned lime, or twice as much ground limestone per acre. During the plowing the lime will then become thoroughly mixed with the soil and will therefore be more efficient. It is well also to add manure before planting and mix it thoroughly with the soil.

If the land is virgin to alfalfa or has not become thoroughly inoculated it is well also to add at this time about one-half ton of soil from a field known to produce good alfalfa plants whose roots are abundantly supplied with nodules. If such soil is not conveniently available, "canned bacteria" or "nitragin" (pure nitrifying bacteria) may be used instead.

A one-pound can of "nitragin" as put on the market commercially is sufficient to inoculate one acre. In purchasing nitragin, care should be taken to ask for "nitragin for alfalfa," as the varieties of this material are specific, and a variety for cow peas will not do for alfalfa.

Most of our soils in Hawaii are fortunately already inoculated

with bacteria and the need of inoculation is not very great. If a field of alfalfa does not do well after a few weeks or better a few months' growth, carefully dig up a few plants and wash away the soil. The absence of nodules on the rootlet is a sure indication to the need of inoculation. (Since the nodules are easily knocked off the roots, extreme care should be used in removing the plant and in washing the soil from it.)

3. *Kind and Quantity of Seed and Method of Planting.* With all other conditions supplied, there still remains the matter of good pure seed. This should be plump, of strong germination, and free from weed seeds. Much of the commercial seed sold in bulk contains dodder and other weed seeds which are difficult to separate from the alfalfa seed. If possible, seed should be secured from a source known to be free from dodder or carefully re-cleaned seed should be used. While it is somewhat difficult to separate the large seeded dodder from ordinary alfalfa seed it can be done by using a screen made of 20 x 20 mesh, No. 34 steel or iron wire on the W. & M. gauge; or, the same mesh of brass or copper wire, No. 32, English gauge. This should be stretched over a light wood frame about 12 inches square. A half pint of seed should be placed in the sieve at a time and thoroughly sifted until all dodder seed is removed. This will require a half minute vigorous shaking, and the results will well repay the trouble.⁷ This one feature should not be slighted, for "Trouble with weeds has caused more alfalfa failures than any other one thing."⁸ It is said that "an ounce of prevention is worth a pound of cure," but in the case of alfalfa it is not only worth a ton of cure, but is the deciding point between success and failure.

(To be continued.)

⁷ Hawaii Sta. Bul. 23.

⁸ Indiana Sta. Cir. 27.

BY AUTHORITY.

PROCLAMATION OF FOREST RESERVE IN THE DISTRICT OF
HONOLULU, CITY AND COUNTY OF HONOLULU, ISLAND OF
OAHU, TERRITORY OF HAWAII.

Under and by virtue of the authority vested in me by the provisions of Chapter 28 of the Revised Laws of Hawaii, as amended by Act 65 of the Session Laws of 1905, and by Act 4 of the Session Laws of 1907, and of every other power me hereunto enabling, I, LUCIUS E. PINKHAM, Governor of Hawaii, with the approval of a majority of the Board of Commissioners of Agriculture and Forestry, having held the hearing of which notice has been duly given as in said Acts provided, do hereby SET APART as a forest reserve to be called the KULIOUOU FOREST RESERVE, that certain piece of government land in the District of Honolulu, City and County of Honolulu, Island of Oahu, Territory of Hawaii, which may be described roughly as being the mauka portion of the government half of Kulionou Valley, and containing an area of 214 acres, more or less, more particularly described by and on a map made by the Government Survey Department of the Territory of Hawaii, which said map is now on file in the said Survey Department, marked "Government Survey Registered Map No. 2520," and "Kulionou Forest Reserve," and a description accompanying the same numbered C. S. F. No. 2363, which said description, now on file in the said Survey Department, is as follows:

KULIOUOU FOREST RESERVE.

Kulionou 1st, Kona, Oahu.

C. S. F. No. 2363.

Beginning at a pipe at the southwest corner of this reserve on the boundary between Kulionou 1st and 2nd, the coördinates of said point referred to Government Survey Trig. Station "Koko Head" being 14704.1 feet North and 7428.8 feet West, as shown on Government Survey Registered Map No. 2520, and running by true azimuths:

1. 176° 37' 6964.0 feet along the land of Kulionou 2nd to the top of the ridge overlooking Koolau at a place called Ele lupe;
2. 313° 05' 1718.0 feet along top of mountain range along the land of Waimanalo;
3. Thence down the top of the ridge along the land of Maunalua to an iron pipe, the direct azimuth and distance being 349° 10' 5439.0 feet;
4. 76° 50' 1917.0 feet along pasture land of Kulionou 1st to the point of beginning.

Area, 214 acres.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the Great Seal of the Territory of Hawaii to be affixed.

DONE at the Capitol in Honolulu, this 13th day of February, A. D. 1914.

LUCIUS E. PINKHAM,
Governor of Hawaii.

By the Governor:
E. A. MOTT-SMITH,
Secretary of Hawaii.

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DIVISION OF FORESTRY.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

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All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications
SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207,
HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent.

THE HAWAIIAN FORESTER AGRICULTURIST

VOL. XI.

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A FENCE POST TEST PROGRESS REPORT.

A year ago a letter regarding a fence post test was published in the Forester, that elicited a good deal of interest. The following progress report adds to the information then given. It speaks for itself:

Another year has elapsed since the eucalyptus cornuta fence posts were set at the College of Hawaii farm with a view to testing their durability under various preservative treatments, also in comparison with redwood posts. The test has now completed its third year, the posts having been set about April 1, 1911.

Reporting the condition of the posts in the order recorded a year ago, [see Hawaiian Forester and Agriculturist for May, 1913, Vol. X, No. 5, pp. 113-114,] our findings are as follows:

Charred posts—Average decay 1-12 inches below surface of ground, $\frac{1}{4}$ - $\frac{1}{2}$ inch.

Tarred posts—Average decay 1-12 inches below surface of ground, $\frac{1}{8}$ - $1\frac{1}{4}$ inch.

Creosoted posts—Average decay 6-12 inches below surface of ground, trace.

Posts set in concrete (no treatment)—Average decay 6-12 inches below surface of ground, badly decayed, possibly half way through.

Untreated posts—Average decay 6-12 inches below surface of ground, $\frac{1}{4}$ -1 inch.

It will be noted from the above that the order in which the various treatments resisted decay was as previously recorded, i. e., the creosoted posts being best preserved, showing only a trace of decay; the tarred posts (dipped in hot tar) being the second best preserved. The charred posts appear to have undergone but slight if any decay since the last experiment. On the other hand the posts set in concrete show rapid disintegration, and as noted in my last report, this appears a very undesirable treatment. The untreated eucalyptus posts show some variation in their power to resist decay; the largest amount of decay noted was about 1 inch in depth and the least about $\frac{1}{4}$ inch.

The posts from which the bark had not been removed at the time of setting have now shed practically all the bark and aside from the marred surface which resulted from the work of the

borers during the first year, no injury seems to have resulted. Good sound untreated redwood posts set with the eucalyptus posts show very slight decay at this time.

The writer recognizes that the results reported in these tests are obtained under rather insufficient data to be exhaustive. In the first place there are too few specimens available for examination and secondly the method of examination is hardly adequate. As in these examinations the posts were bared of the first foot of all soil and the condition as there noted recorded, contemplated changes in fencing during the coming year will require that the posts will be removed bodily, thus permitting of a thorough examination.

On the whole, I think the experiment as it stands demonstrates the value of creosoting over all other methods tried. Not alone is this material a very effective preservative, but it is easily applied, and the cost is not prohibitive. I should certainly recommend creosoting at the cost of $12\frac{1}{2}$ cents per post. It is somewhat doubtful whether the cost of peeling at 5 cents per post is justifiable except it be for appearance. Especially since little damage was done the posts other than marring the surface.

I trust that the Division of Forestry may see fit to coöperate with the college in planning a more exhaustive experiment along this line as was suggested some time ago. This would seem an especially opportune time as the college farm contemplates an extensive system of fencing in the near future.

F. G. KRAUSS,
Professor of Agronomy.

The College of Hawaii, Honolulu, Hawaii, March 30, 1914.

HINTS TO ONION GROWERS.

Some hints on the growing and shipping of onions are given by the *Agricultural News*, being mainly from a circular prepared by the curator of the botanic station, Antigua, Leeward Islands. The article says in part:

"As regards seeds, these should not be kept in paper parcels, though they may be stored in air-tight receptacles for a period of a few months. In connection with the nursery work, beds should be prepared before the arrival of seed in order that the soil may 'cool out'; to keep ants away from seed, kerosene should be applied to the bed before germination, not after. As regards watering, a good soaking every three or four days gives better results than daily sprinkling, and the water should not be applied after 8 a. m. In transplanting, the laborers must be carefully watched to prevent their damaging the young plants by careless handling.

"Onions are liable to the attacks of caterpillars. To check this,

dusting with Paris green and lime should be resorted to, but the grower must not dust with any insecticide when the bulbs are nearing maturity.

"Coming to the establishment of the crop in the field, the planter should remember that sowing seed *in situ* will give a crop from three to five weeks earlier in maturing than when the transplanting method is adopted; but it appears that a large proportion of the onions raised in this way may be of indifferent shape. In collecting the crop, the bulbs must not be left in the field for any length of time after pulling, though a few hours in the sun is a good thing. The bulbs must not receive the slightest injury, nor must the necks of the bulbs be twisted to hasten ripening if it is the intention to ship. Onions deep in the soil often rot before they are thoroughly ripe: these should be used to meet local demands; they are unfit for export."

Some American and Canadian markets, it is said, disapprove of onions with thick necks. In the case of produce going to the north, it is advised that the caution, "Keep from frost and boiler," should be put on the crate. The *Queensland Agricultural Journal* is quoted as pointing out "that onions when pulled should not be stored away at once but should be left on the ground for a few hours to dry. They require constant looking over to sort out any bad ones for, as in the case of fruit, a single rotting onion will infect all those in its immediate neighborhood. Reference is made, in continuation, to a very interesting manurial experiment in connection with the effect of chemical fertilizers upon the tendency to sprout. It was found that the produce from plots deprived of sulphate of potash were exhausted by a too hurried vegetation, while that which had received the potash manure was perfectly preserved. The writer advocates the application of 1 cwt. of sulphate of potash per acre."

Six or seven years ago, an exchange says, the output of coconut butter in Austria was about 40 tons a day. It is now approximately 300 tons. The price has increased from \$18.25 to \$26.40 for 200 pounds, and the factories claim they cannot keep up with the demand. The market is controlled practically by two firms, one in Vienna and the other in Aussig.

According to the *Gardeners' Chronicle*, there are indications that the realization of the long-thought possibility of employing electricity in horticulture and agriculture will soon be achieved. Lemstrom, it was pointed out by Thorne Baker in a paper read before the Royal Society of Arts, long ago claimed to have demonstrated that an increase of 45 per cent. in a crop is produced by the agency of high-tension electricity applied to the land through overhead wires. Sir Oliver Lodge, Mr. Newman and

Prof. Priestly, working with overhead discharges, have also obtained encouraging results. It is stated that the cost of the Lodge-Newman apparatus—which, by the way, has been adopted by the departments of agriculture of the United States and Egypt—works out at \$1000 for 25 to 30 acres, and for the treatment of double that area only a small increase in cost is entailed.

Rascality in handling old rice is exposed by the *Queensland Agricultural Journal*, which mentions the fact that powdered talc is used in the renovation of damaged rice. Old, discolored, worm-eaten rice is said to be so treated that it takes on the appearance of new grain, which is said to be very injurious to native laborers in tropical countries where rice is the staple food.

Hawaii is probably nearly ripe for the introduction of an agricultural bank or banks. Homesteaders and small ranchers ought to be placed in position where they could obtain long term loans at moderate interest rates on the security of their land. J. R. Cahill, who investigated the German system of rural credits for the British board of agriculture, in the prefatory note to his report says that in no modern state does organized effort for safeguarding and promoting the economic interests of agriculture appear to have been so persistent and successful as in Germany, more especially in the direction of providing the farmer with facilities for obtaining credit, for acquiring the instruments of production, and for disposing of his produce on the most favorable terms. In Germany landowners can obtain mortgage loans through a variety of special institutions for mortgage credit. At present the total outstanding loans obtained through such agencies may be estimated at approximately two billion dollars. The goal of a coöperative bank loan in practically every parish of the whole monarchy has now been nearly reached. There are in Germany 17,000 agricultural coöperative banks, with a total membership of over 1,500,000. In 1910 the total turn-over of 14,729 such banks amounted to about \$1,273,000,000. In the sixteen years, 1895 to 1910, only nineteen rural credit societies were involved in bankruptcy.

Mr. Thorne Baker's account of electrified chickens (in a paper presented to the Royal Society of Arts) reads more like a chapter in romance than in technology, says the *Gardeners' Chronicle*. The mortality of birds hatched in electrified incubators is said to be extremely small, and the chickens are ready for market in five weeks instead of three months. They thrive on less food, lose their shyness, sparks fly from their beaks when they peck at a finger held out to them—the owner of the finger feels a distinct shock, but the birds seem unaware that they are other than just ordinary chickens.

"Who says rubber does not pay?" *Tropical Life* asks, answering that "Ceylon certainly cannot when conditions are favorable and the estates well managed." As evidence it cites the Ceylon papers received February 28, which show that the "Rubber Plantations of Kalutara" had declared 110 per cent dividend, besides placing to reserve and carrying forward a total of \$45,000:

The *Experiment Station Record* is quoted by the *Agricultural News* as saying: "In the manuring of rice, Japan is very far in advance of any other rice-growing country; in the manuring of mulberry Japan has no equal; in the manuring of tea she is behind Ceylon and in advance of China, and in the manuring of sugar cane considerably behind Hawaii and in advance of the Philippines."

DIVISION OF ANIMAL INDUSTRY.

Honolulu, April 7, 1914.

The Honorable Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I beg to report on the work of the Division of Animal Industry for the month of March, 1914, as follows:

Glanders.

As mentioned in my last report an outbreak of glanders among a bunch of horses and mules running in a pasture belonging to the Wailuku Sugar Company, but owned by various employees, laborers and residents of the district, caused considerable alarm in the neighborhood and especially on the plantation in question, the pastures infected being the rest pasture where the plantation work animals as a rule were turned in from Saturday noon to Sunday evening.

In this same pasture an aggregate of 35 to 40 privately owned horses and mules were allowed to run, the majority of these animals being worthless superannuated scrubs and cripples, useless for any kind of work, but which the respective owners, with the pronounced local characteristic, cannot make up their minds to have destroyed.

The plantation management unfortunately, in some instances at least, is compelled to pasture some of these animals, but, in view of their run down condition and their liability to harbor or carry any kind of parasites or any infectious or contagious disease, it would seem unwise to place them in the Sunday rest pasture, to infect grasses, posts and watering places throughout the week, and then mingle freely with the plantation work stock during Saturdays and Sundays. In this way an old mare with

a colt at foot was turned into the pasture, and, whether due to the change in feed, the drain on her system in suckling the colt or to the exposure to the then prevailing cold winds and rain, she promptly developed acute glanders and proceeded to scatter it broadcast over the pasture. Her condition was noticed shortly afterwards, but not until one of the plantation mules had developed the disease. The mare was then removed from the pasture and was later found only with difficulty. On post-mortem examination she was found to be a typical "carrier" with old characteristic scars in the nose, and numerous calcareous nodules in the lungs, the lesions indicating that the disease had remained dormant in her system for some considerable time and had only recrudesced with the change to the open pasture. The local deputy, Dr. Fitzgerald, immediately upon locating and destroying this animal, rounded up all horse stock with which she had come in contact since developing the disease, submitting them all to the mallein test and destroying six, which gave typical reaction, all of them being animals of little or no value and some of which showed old lesions in the lungs, indicating previous infection. All of these animals belonged to the same owner as the mare in question.

That only one plantation mule should have become infected speaks well for the natural resistance possessed by animals kept in the prime of condition, which was the case with all of the plantation work animals, and there can be little doubt that had they been covered with open harness galls and raw chain sores, such as was frequently the case a few years ago on this as on many other plantations, the infection would have gained entrance into many another animal system. Not until three weeks after it was believed that the outbreak had been completely suppressed did one more mule show suspicious symptoms, when at the request of Dr. Fitzgerald and with the Board's permission I went to Kahului to look over the situation. This case proved, however, to be one of epizootic lymphangitis, a disease in every respect as dangerous as glanders, except that it cannot be transmitted to man, but otherwise absolutely independent of this disease and non-reacting to the mallein test. It is the same disease which some years ago caused such heavy losses to the H. C. & S. Co. and to the Maui Road Board, but which since has been encountered only in scattered and very rare cases in the Islands. It was nevertheless decided to submit the entire Waihee plantation stable to the mallein test, and also to retest the outside animals still running in the rest pasture.

As not a single reaction was obtained, even though the extremely sensitive intra-dermal method was used, it is safe to conclude that the glanders outbreak was suppressed with the destruction of the reactors to the first test, and that the appearance of the later case of epizootic lymphangitis was merely a coincidence. It was nevertheless recommended that the Waihee stables be

thoroughly disinfected and whitewashed, and that the top layer of the stalls be removed and replaced with fresh sand. A most thorough disinfection is always required when dealing with this disease as the specific infection, a fungus of the *saccharomyces* group, is very tenacious to life and much more persistent than the glanders bacillus. In both instances, however, there seems to be local conditions tending to vitiate their original virulence as the simultaneous decrease in the number of outbreaks of both diseases fully demonstrates.

Tuberculin Control Work on Maui.

I am pleased to report that the suppression of bovine tuberculosis on the island of Maui has progressed to a further extent than I felt justified in concluding from the reports received. To this may be added that the H. C. & S. Company has established the best equipped, sanitary and hygienic dairy that I have seen anywhere in the Islands, milking about sixty head of tuberculin tested cows and delivering the cooked and aerated milk in sealed sterilized bottles. Dr. Fitzgerald has tested some 2500 head of cattle and feels certain that little if any milk is being sold or provided from untested cows unless it be in some distant localities or in private families. All reacting animals have been branded and immediately segregated until butchered under his inspection. From his observations it is evident that bovine tuberculosis is much less prevalent than was the case on Oahu four years ago, and which seems to be the case on Kauai. These observations are borne out by a statement from the Board of Health physician on Maui, Dr. McCorskey, who upon inquiry informed me that infantile tuberculosis in any form is very rare and seems to have become more so of late. There is therefore every reason for encouraging this work so well begun, especially considering that no charge has been made for any tuberculin testing or other work connected therewith (meat inspection, for instance) even though his transportation over hundreds of miles in carrying it out has been provided by himself.

In regard to the bovine tuberculosis situation on Kauai, conditions do not seem quite so favorable. A letter received from Dr. Glaisyer and pertaining to this subject is herewith appended and is self-explanatory. The same may be said of the Island of Hawaii from where the correspondence of Dr. Elliot is appended. I shall, however, continue to keep the matter before the respective deputies and will only recommend at the present time that they be provided with the requisite ear tags and pincers as well as with tuberculin and syringes and needles with which to carry out the work without actual expense to themselves.

Honolulu Quarantine Station.

During the past month an addition consisting of two rooms has been added to the keeper's quarters, thereby enabling him to

keep his family living with him. The total cost to the Board of the extension has been \$175.00, all labor having been provided by the regular employees. In order to meet the requirements of the Board of Health it will, however, be necessary to ask for an additional \$15.00 or \$20.00 for sewer pipe vent and trap. This expense was unforeseen, the extension of the one-room covering the old cesspool and necessitating its relocation. But as the health inspector had frequently complained about the old arrangement the change would have had to be effected anyhow before long, as with children living in the house it would have been insisted upon.

The appended report of Dr. Case is interesting in so far as it describes a new method of administering the intra-dermal tuberculin test, evolved by himself, and which seems promising in being less dangerous to the operator as well as more convenient and cleanly, the field of operation being changed from the sub-caudal folds to the lower eyelid. With the cows in the stanchions the operator's place is changed from the gutter behind the animals to the feed alley and the constant danger of being kicked is done away. Besides this the method offers many advantages as described in the doctor's report.

Respectfully submitted,

VICTOR A. NORGAARD,
Territorial Veterinarian.

March 31, 1914.

Dr. Victor A. Norgaard,
Chief of Division of Animal Industry,
Honolulu, T. H.

Sir:—I have the honor to report as follows for the month of March:

Tuberculosis Control.

The cattle in the following dairies have been tested during the past month:

	T.	P.	C.
T. F. Farm.....	29	29	0
I. Nagaki	27	27	0
Chas. Bellina	156	144	12
Alex. Young	39	39	0
S. Tsuda	15	15	0
H. E. Cooper.....	16	16	0
W. P. Alexander.....	6	6	0
F. Andrade	102	96	6
Oahu College	14	14	0
College of Hawaii.....	16	16	0
Mills Institute	15	14	1

	T.	P.	C.
John Gomes	46	46	0
Joe Gouviera	33	33	0
M. F. Brazon.....	19	19	0
R. Compos	69	68	1
M. Nishimoto	10	10	0
John Alias	6	6	0
R. A. Franco.....	15	15	0
A. Pacheco	16	16	0
M. M. Pedro.....	32	32	0
M. K. Young.....	30	30	0
S. Hiarata	19	19	0
K. Yamashita	22	20	2
S. I. Shaw.....	31	26	5
J. L. W. McGuire.....	25	25	0
Victorino Souza	4	4	0
Capt. Hartman	5	5	0
M. Riedel	10	10	0

The above tabulated list shows that 827 head of cattle were submitted to the test of which 27 were condemned and branded. Out of the total number tested 167 received the test for the first time. Practically all of these new cows had been brought over from the Island of Hawaii.

In the last seventy-five or more cows tested I have used the fold of the lower eyelid of the left eye as a more convenient place to make the injection than the sub-caudal fold. The advantages of making the injection at this point are: 1st, the field of operation is clean, there being no possibility of infection from feces or urine and although I have always regarded infection from these two sources as practically nil it is better to do away with any chance of it; 2nd, there is no opportunity for any of the serum to be squeezed out of the tissues as might readily happen in the sub-caudal fold by strong depression and switching of the tail; 3rd, the reactions are as a rule larger, some reaching the size of the closed hand; the view is unobstructed and offers easy comparison with the opposite side; 4th, the head is far more easily fixed and held in the desired position than the hind quarters, thus greatly facilitating the proper injection of the serum and doing away with all injury to the operator from vicious or highly nervous animals.

Importation of Live Stock.

March 2—Sierra, San Francisco: 13 crates poultry.

March 3—Hilonian, Seattle: 2 Berkshire hogs, A. & B. (Kaanapali).

March 3—Matsonia, San Francisco: 6 crates poultry.

March 3—Dix, Seattle: 32 horses, Q. M. Dept.; 1 coach dog, G. Edwards.

March 5—Shinyo Maru, Orient: 1 crate Jap games.

March 10—Lurline, San Francisco: 26 mules, Schuman Carriage Co.; 10 Merino rams, Hind, Rolph & Co.; 7 crates poultry.

March 11—Mongolia, San Francisco: 1 crate ducks, W. F. X Co.

March 13—Virginian, Seattle: 262 butcher hogs, 5 mules, 2 horses, A. L. McPherson.

March 16—Sonoma, San Francisco: 1 English bull dog, J. M. Kelley.

March 17—Wilhelmina, San Francisco: 13 crates poultry; 1 box rabbits, W. H. Hoogs.

March 24—Manoa, San Francisco: 3 parrots, E. O. Childs; 13 crates poultry.

March 27—Chiyo Maru, Orient: 14 crates Chinese pheasants.

March 30—Hyades, Seattle: 1 Berkshire sow, A. & B. (Kanapali).

March 30—Sierra, San Francisco: 14 crates poultry.

March 31—Matsonia, San Francisco: 17 crates poultry, 3 bxs. rabbits, 3 bxs. white mice, U. S. L. Station; 2 Dachshunds, E. Duisenberg; 1 cage canary, G. A. Marshall.

Respectfully submitted,

L. N. CASE,
Assistant Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

Honolulu, March 31, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the work performed by the Division of Entomology for the month of March, 1914, as follows:

<i>Disposal</i>	<i>Lots</i>	<i>Parcels</i>
Passed as free from pests.....	1227	23,911
Returned to shipper.....	7	166
Fumigated	2	3
Burned	86	91
Total inspected	1322	24,171

Of these shipments 23,785 packages arrived by freight, 262 packages by mail and 124 packages as baggage of passengers and immigrants.

Rice and Bean Shipments.

During the month 17,872 bags of rice and 2366 bags of beans arrived from Japan and having been found free from pests the various shipments were passed for delivery.

Pests Intercepted.

Sixty-five packages of fruit and 23 packages of vegetables were found in the baggage of passengers and immigrants from foreign countries, all of which, being prohibited from entry, was seized and destroyed by burning.

One hundred and sixty boxes of wormy apples were returned to the shipper at San Francisco and 363 cases containing apples had to be overhauled as a few worms had spun their cocoons on the boxes, but we found the apples free from worms. No doubt these shipments have been standing in a packing house where a lot of wormy fruit has been handled.

A shipment of various species of Yam tubers sent here by the U. S. Experiment Station at Manila for trial in these Islands arrived on the S. S. Siberia. The yams were in good clean condition. However, in the packing we found a nest of our common black ant (*Prenolepis longicornis*). After fumigation we passed the shipment for delivery. Five packages of plants were found in the post office, which had arrived from foreign countries, and as these are prohibited from entry under the new ruling of the Federal Horticultural Law they were returned to the sender.

A small box of dead baked worms, similar to those found in the twigs, and which arrived during last month, was found in the mail. These were to be used as medicine.

Hilo Inspection.

Brother Newell at Hilo reports the arrival of nine steamers and three sailing vessels, of which six steamers brought vegetable matter consisting of 107 lots and 1924 packages, all of which was free from pests. There also arrived direct from Japan per T. K. K. steamer Kiyō Maru 6100 bags of rice and 420 bags of beans, all of which was found free from pests and all passed for delivery.

Inter-Island Inspection.

During the month of February 67 steamers plying between the Islands were attended to and the following shipments were inspected and passed:

Plants	75	packages
Taro	510	bags
Vegetables	32	packages
Fruit	25	"
		<hr/>
Total passed	642	"

The following packages were refused shipment on account of being either infested with pests or having objectionable soil attached to the roots:

Plants	14	packages
Fruit	3	"
Vegetables	1	"
		<hr/>
Total refused	18	"

Respectfully submitted,

E. M. EHRLHORN,
Superintendent of Entomology.

DIVISION OF FORESTRY.

Honolulu, March 31, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I have to submit as follows the routine report of the Division of Forestry for March, 1914:

Forest Fencing Projects.

During the month progress has been made on several projects of forest reserve fencing.

Mr. A. M. Brown, for the Cornwell Ranch, Maui, reports the completion of the forest fence on the makai boundary of the Kula Forest Reserve; Mr. Chas. H. Will of Hilo, contractor for the fence at Ninole, Kau, Hawaii, states that that job is finished; and Mr. Alike Dowsett informs me that the repairs on the Lualualei Forest Reserve boundary fence, Waianae, Oahu, are progressing.

After much negotiating a contract has been drawn up and signed for the construction of a forest fence across a portion of the government land of Wailua, Lihue, Kauai, and only the final details wait to be arranged with regard to another forest fence, across the Lualualei Reserve, above Waianae, Oahu.

Work on other fencing projects is going forward on Maui, and

a considerable part of the preliminary detail has been attended to regarding other proposed fencing projects on Hawaii.

Forest Planting.

On March 18th an agreement was signed with Messrs. Macfarlane & Robinson of Paumalu, Oahu, to plant with forest trees a portion of the Pupukea Forest Reserve, formerly known as "Water Reserve A," in return for the temporary use of the land for growing pineapples. The actual tree planting does not take place for some time, but when it is done the trees will get the benefit of the cultivation given the land while under pineapples.

The planting of the slopes of Mt. Sugar Loaf, above Makiki, Oahu, has continued steadily during March. The block of Koa at the head of the sub valley below Round Top has been practically completed. During April a stand of Kukui trees will be put in on the lower slopes, to round out the planted area.

Routine Administration Work.

A considerable part of my time during March was given to attention to the details of various projects now under way in the Division of Forestry and to matters referred to me by the Commissioners. About the middle of the month I devoted parts of several days to assisting the Land Office and the Survey Department in a revision and retabulation of the List of Government Lands. Towards the end of the month I drew up for the use of the Board a revised estimate of expenditures for the remainder of the present fiscal period, to conform to the reduction made necessary by decreased income.

Distribution of Basket Willows.

The U. S. Forest Service having become interested in the experimental planting by this Division of basket willows from the Azores, sent us during March for distribution and trial, cuttings of five species of American basket willows. Part of the consignment has been planted at our experiment garden in Makiki Valley. The remainder of the cuttings have been distributed to correspondents of the Division in different parts of the Territory. This experiment is one that is worth watching for there appears to be no good reason why a considerable industry should not in time be built up here through the manufacture of various articles from basket willows.

As usual I transmit herewith the report of the Forest Nurseryman, recounting in detail the work at the Government Nursery.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, March 31, 1914.

R. S. Hosmer, Esq.,
Superintendent of Forestry.

Dear Sir:—I herewith submit a report on the principal work done during the month of March, 1914:

*Nursery.**Distribution of Plants.*

	In seed boxes	In boxes transplanted	Pot grown	Total
Sold	4000	...	1592	5592
Gratis	250	950	1309	2509
	<hr/> 4250	<hr/> 950	<hr/> 2901	<hr/> 8101

Collections.

Collections on account of plants sold amounted to	\$ 15.55
Rent of building, Nursery Grounds, for 4 months ending with February, 1914	140.00
Total	<hr/> \$155.55

Plantation Companies and Other Corporations.

The distribution of plants under this heading amounted to 1000 in seed boxes, 1250 in transplant boxes, and 455 pot grown, total 2705.

Seed Collecting.

The season is again coming in for the ripening of most of our forest tree seed and our two seed collectors will be busy for some time getting a fresh supply.

Makiki Station.

One hundred of each of the five varieties of the basket willow cuttings received from Washington have been planted and will be given our best attention.

The getting up of a stock, mixing and sterilizing soil and doing other routine work has constituted the principal labor done during the month. A number of the new species received are sprouting and will be ready for transplanting soon.

Honolulu Watershed Planting.

The work of planting Sugar Loaf and the surrounding district is getting along nicely. Trees to the number of 1199 were planted during the month and holes are dug for about 500 more. The total number of trees planted up to the end of March amount to 3740, all of which are Koa.

Advice and Assistance.

For the past six or seven months the writer has not had the time to attend to the giving of advice and assistance with the exception of a few visits per month to places in and around the city, the answering of questions by telephone or people calling at the nursery. I have not been keeping a record of this work for the reason that I considered the giving of advice and assistance in this way was ordinary routine and done as a kind of obligation and only when there was time to attend to such work without interfering with the more important work which we have on hand. Should you and the members of the Board deem it necessary that I shall keep a record of all visits which I make, also the names and addresses of the people who ask questions over the telephone and call at the nursery as well as the questions asked and the answers given to each I will do so and will record the same in my monthly reports.

During the month of March I visited the Capitol grounds at the request of Mrs. F. J. Lowrey; Fort Armstrong, at the request of Captain Hatch; College Hills and Manoa, for the purpose of inspecting the trees along the streets in regard to pruning. There are a few more requests still on the waiting list.

The more important work, and the work with which the writer's time is mostly taken up, is as follows: The tree planting on Sugar Loaf. The propagating and attending to new species which we are raising from seed sent to us from abroad. The propagating and keeping in stock a supply of trees wanted by homesteaders, military organizations, plantation companies and others. Attending to the distribution and shipping of plants, answering letters of inquiry from people on the different islands, attending to the seed exchange and correspondence connected with same, etc. About one-half day out of every two days is spent with the men on Sugar Loaf. It is necessary to keep close tab on the men to get the best results. They are all Portuguese, none of them can sign their own names, and their knowledge of English is very limited. This kind of work was new to them all when they started with us and of course they have to be watched closely. This work I think should claim our first attention and all our efforts should be directed toward making this undertaking a great success. The trees are making a splendid growth and there is every indication that this piece of work will prove to be

one of the best achievements in the line of tree planting attempted by the Board in the past ten or twelve years.

The experimental work in connection with the introduction of new species is, in the writer's opinion, very important and demands our closest attention. With the assistance of one man to help plant and attend to the trees we can do a good deal in the way of testing out the different species of seed which we are receiving from Mr. Rock and through the exchange of seed which we conduct with a number of Botanical Gardens and other institutions in different parts of the globe. The raising and distributing of about half a million trees a year requires a good deal of attention as any person who has any idea of the business knows. The trees are shipped to places all over the different islands and letters and bills of lading have to be attended to. Only trees of the very best of their kind are sent out and the people now know that they can depend on getting what they ask for and the best at that.

By attending to the most important work and attending to it well, will, in my opinion, be the means of giving us more credit and do us more good than dabbling in too many jobs and not being able to attend to any of them, as they should be attended to.

Respectfully,

DAVID HAUGHS,
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

April 9, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the division of hydrography during the month of March, 1914, is submitted:

Kauai.

Construction work on the Kalihiwai stream gaging station was completed and the register installed. Work on the new trail up the Lumahai stream to the new station site was started.

Complete rainfall data received show that 475 inches of rain fell on Waialeale (elevation 5080 feet) in 1913, against a total of 405 inches in 1912. Owing to the high cost of reading this station it will be temporarily discontinued during the fiscal year 1915.

Oahu.

Clock register stream measurement stations were constructed on the Punaluu, Kahana, and Haiku streams, and a staff gage

station was established on the East Branch of the Kahana stream. All of these streams were equipped with bridges on cables for flood measurements.

At the request of the Governor a reconnaissance was made of the Pauoa waters. A copy of this memorandum is attached hereto.

At the request of the Deputy Attorney General an opinion relative to the purchase of Pauoa waters, and to the future of Honolulu's water supply was furnished that officer. A copy of this letter is attached hereto.

Maui.

Only routine stream gaging and rainfall measurement work was undertaken. A set of discharge measurements was made on one of the West Maui ditches which disclosed the fact that the actual discharge was one and one-fourth million gallons per day more than was shown by the weir formula. As this water is sold at \$7.00 per million gallons these measurements have aroused considerable interest both to the seller and buyer of the water.

Personnel.

W. V. Hardy, in charge of Kauai, has been transferred to the California District of the U. S. Geological Survey.

J. C. Dort, former office engineer, will take charge of Kauai work after April 1, 1914.

G. R. White, field assistant, has been released.

Application for transfer for Howard Kimble, assistant engineer, from the Hawaiian Islands to the mainland has been requested of the Washington office of the U. S. Geological Survey to take effect June 30, 1914.

D. E. Horner, field assistant on Kauai, will be released on the completion of construction in hand, probably about June 30, 1914.

Very respectfully,

G. K. LARRISON,
Superintendent of Hydrography.

MEMORANDUM FOR THE GOVERNOR.

Honolulu, T. H., March 14, 1914.

On March 12, 1914, the undersigned made a set of measurements of all springs of the Pauoa valley, and the following results were obtained:

1. Pauoa Stream above Pacific Heights intake and above all diversions, elevation 680 feet: dry.
2. Pauoa Stream, immediately below Pacific Heights intake (seepage and leakage from same), elevation 660 feet, 110,000 gallons 24 hours.

3. Pump House Spring, elevation 630 feet, 105,000 gallons 24 hours.

4. Kahuawai Spring, elevation 590 feet, 320,000 gallons 24 hours.

5. Kaikahi Spring, elevation 275 feet, 98,000 gallons 24 hours.

There is no way of measuring the amount diverted by the Pacific Heights pipe line.

All of the above sources were being diverted by irrigation ditches. The stream below the road crossing at an elevation of about 250 feet being dry.

A comparison of these amounts of water with the amounts found previously show that the Pump House Spring (elevation 630 feet) and the Kahuawai Spring (elevation 590 feet) have decreased about ten per cent., while the Kaikahi Spring (elevation 275 feet) has decreased more than 60 per cent.

Extremely dry weather has prevailed, the February rainfall being extremely light. Indications point to even a smaller discharge from these springs during the coming summer and fall months.

As the season progresses, additional measurements will be made and the results furnished to you.

Attached hereto is a copy of a memorandum showing previous measurements.

G. K. LARRISON,
District Engineer.

MEMORANDUM RE BOOTH WATERS.

Spring No. 1.—Pacific Heights. Elevation, 670 feet; 46,000 gallons per day. Water from mauka, measured below Spring No. 1 so as to include leakage from No. 1, about 317,200 gallons per day. On April 6, 1911, W. F. Martin measured by current meter and found 519,000 gallons.

Spring No. 2.—Pump House Spring. Elevation, 630 feet. Spring considered by C. W. Booth better than Pacific Heights Spring No. 1, which has been confirmed by Baldwin & Alexander, 121,800 gallons. Measured by W. F. Martin April 6, 216,000 gallons.

Spring No. 3.—Kahuawai Spring. Elevation, 590 feet; 366,000 to 408,200 gallons per day. (Land does not belong to Booth.) Measured by W. F. Martin April 7, 1910, 349,000 gallons; measured by W. F. Martin April 6, 1910, 369,400 gallons. Reported on from data, Max Lorenz, March 4, 1905, 400,000 gallons.

Spring No. 4.—Elevation 320 feet, on Booth land; 19,000 gallons per day.

Spring No. 5. — Kaikahi Spring. Elevation, 275 feet; about 255,000 gallons per day. Second largest spring. Nov. 15, 1902,

Grimwood, Richardson & Holloway reported flow 253,700 gallons. April 15, 1910, W. F. Martin measured 375,000 gallons per day.

Summary.

Mauka sources	317,000	gallons
Spring No. 1.....	46,000	"
Spring No. 2.....	122,000	"
Spring No. 3.....	380,000	"
Spring No. 4.....	19,000	"
Spring No. 5.....	255,000	"
	<hr/>	
	1,139,000	"
With other waters about.....	1,200,000	"
	<hr/>	

The tenth successive year without a forest fire has just been passed by the Powell national forest in south central Utah.

Yellow poplar, or tulip tree, the largest broadleaf tree in America, has been known to reach nearly 200 feet in height and 10 feet in diameter.

Pennsylvania has about $7\frac{1}{2}$ million acres of timberland, one-eighth of which is owned by the state. The total value of the state's timber is 139 million dollars.

Mistletoe thrives on the western coasts to an extent not approached in the east. In many places this parasitic growth is responsible, directly or indirectly, for a considerable loss of timber.

Forest officers in Washington and Oregon plan to discontinue the use of barbed wire on their forests. This will affect their own pastures and public drift fences. They say barbed wire has no advantage over smooth wire, that it injures stock, and that it is more likely to be borne down by soft snow. Stockmen on the Ochoco forest, in Oregon, recently constructed drift fences of smooth wire, though with some misgivings; now they say they will never use barbed wire again.

.. ALFALFA—A PROMISING FORAGE CROP FOR HAWAII.

By WILLIAM H. MEINECKE, Class of 1913.

(Continued.)

The quantity of seed to be sown depends directly upon one of three conditions:

(1) If the purpose is the production of seed, the planting should be very light, from 5 to 10 pounds per acre being the general practice.

(2) The amount of available moisture, whether in the form of natural rainfall or irrigation water, is a very important factor as alfalfa requires a large amount of water. The dryer the region, the thinner the planting should be. The Indiana Station recommends the sowing of 10 to 15 pounds in dry regions.

(3) Where the conditions are optimum, the *method of planting* is the deciding factor, especially when the purpose is the production of hay or green fodder. Two methods are generally used, as follows:

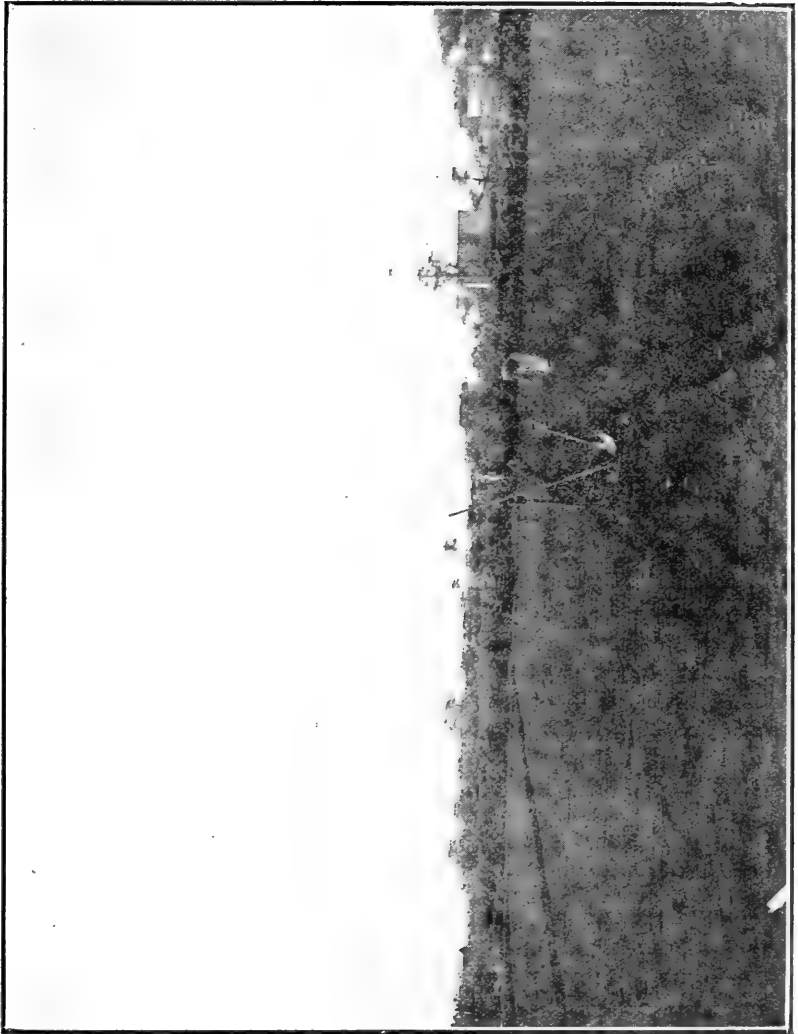
(a) *Broad Casting* requires from 18 to 30 pounds of seed per acre, Thos. Hunt⁹ recommending never less than 20. This is the casier method and is commonly practiced in many parts of the United States and also in Hawaii. However, it is an uneconomic method where there is apt to be an attack of weeds and insects, as it is very difficult to combat these enemies without destroying a large number of the young plants and after cultivation is impossible.

(b) *The Drill Method* is recommended in almost every State of the Union. This method is not only more economical of seed and secures a more uniform stand, but facilitates the combating of noxious weeds and insects and also cultivation without damaging a single plant. From 10 to 20 and even 25 and 30 pounds of seed per acre is generally recommended by the various experiment stations of the mainland, while the College of Hawaii experimental plots yielded very well at the rate of 15 pounds of seed per acre. The Molokai Ranch found 14 quarts or about 25 pounds per acre very successful.

An ordinary seed planter with an adjustment for onion seed will answer every purpose if handled judiciously. An excellent planter worthy of high recommendation is the "Planet Jr." for small fields. This tool has adjustable parts and may be used as a planter for any kind of seed up to corn and is also a very satisfactory cultivator for alfalfa. It is light, strong and easily handled, and is especially suited to rows one foot apart.

The distance apart of the rows seems to be generally one foot,

⁹ Forage and Fiber Crops in Hawaii.



Preparing the Ground for Alfalfa at College Farm, College of Hawaii, August 20, 1912.

though many planters have been successful with two foot rows, which facilitate the use of horse cultivators. For our Hawaiian conditions, one foot rows seem to be the best.

Wide spacing of rows means a greater chance for the encroachment of weeds, but where they are scant this may be worth consideration. Unfortunately the writer has found but one reference¹⁰ to the double row system of planting alfalfa. It was tried out at San Antonio, Texas, and found to be the best method,

¹⁰ U. S. D. A., B. P. I. Cir. 106.

double rows eight inches apart with a cultivated space of twenty-four inches between being used. This method has proved a decided success with pineapples in Hawaii, and is undoubtedly worthy of a few trials.

The Time of Seeding. Owing to the prevalence of cut worms, the fall months are safest for seeding alfalfa in Hawaii; August, September and October being the months recommended by the most successful growers. The seeds will grow well at any season of the year but the prevalence of cut worms is the only limiting factor where moisture conditions are favorable.

Treatment after the Crop is Established. Replanting is very often practiced and is to be highly recommended, as it fills in the gaps which would otherwise be occupied by weeds and also results in a more uniform stand.

Once the crop is established, it needs very little attention. If properly spaced it will cover almost the entire space and will thus keep down the weeds till the crop is harvested. Where irrigation is necessary, it should be done immediately following the harvest. A single heavy irrigation is better than two light ones, but one should be careful not to irrigate too heavily on heavy soils. Light cultivation immediately after harvesting to form a good mulch helps greatly in the preservation of moisture and in destroying what few weeds there may be in the soil and also helps the crop generally.

The most economical practice is to irrigate if at all as soon as the crop is off the field and then cultivate lightly as soon after as the land is in condition to form a good mulch. No other treatment is necessary if the seed bed has been properly prepared.

According to the Hawaii Station Bulletin 23, "The amount of water used varies greatly in different localities and by different growers. On the low sandy and gravelly soils of the lee side of Oahu, weekly floodings ranging from 50,000 gallons to more than twice that amount per acre, are found necessary during dry weather. On the more retentive mauka lands, as at Moanalua, 50,000 gallons and less applied fortnightly is found ample."

Harvesting. Different varieties of alfalfa mature anywhere from 18 to 30 days and even longer. In the central part of the United States, 3 to 4 crops are harvested annually while California generally harvests from 4 to 8 crops annually. Here in Hawaii, the common variety will produce 8 to 12 crops per annum, while the Arabian will produce about 18, since it is an earlier maturing variety. Covering a period of 18 months, there has been produced on the College farm an average of about 13 crops per annum.

Ordinarily the field is ready for harvesting when about one-tenth to one-fourth of it is in bloom, or when the lower leaves begin to wilt and turn yellow. Many varieties do not bloom well and may even start the new growth before the appearance of blossoms; such varieties are ready for the sickle as soon as the

new shoots begin to appear. As the leaves contain the greatest amount of food value, the crop should be harvested before they have begun to fall.

Fresh green alfalfa should not be piled up or stacked for any length of time, as it almost immediately begins to heat, and will spoil in a very short time. It should be spread out in the shade until a short time before feeding if it is to be fed green.

If the crop is to be ensilaged, it should be allowed to dry out a little before being placed in the silo, for it has been found that fresh, green, unwilted alfalfa will not make as good silage as that which has been allowed to become partially dry. Since it will not pack well unless it is chopped, one should not take the risk of packing it as it comes from the field. The crop must not be allowed to dry out enough to become brittle before being placed in the silo as it will fail to make good silage when in that condition.

While the silo has not yet come into general use in Hawaii, it has in most cases already proved a successful method of preserving green succulent fodder under Hawaiian conditions. And it is probable that its use will be greatly extended.

Although Mr. Pond was quite successful in making alfalfa hay and sold considerable baled hay, making has not been practiced in Hawaii except in an experimental way, because green feed is generally available throughout the year and it is therefore unnecessary to preserve our fodder.

However, alfalfa must be cut very soon after maturity as it cannot profitably be left in the field for more than a week. If the crop cannot be utilized or sold, the only profitable resort will be to turn it into silage or hay.

The making of alfalfa hay, as practiced on the mainland, is somewhat different from that of wheat hay, owing to the nature of the crop. On large farms kiln dried hay has proved economical, but it is not practical on smaller fields.

The crop is allowed to lie where it falls as it is cut and is turned over lightly once or twice during the day. It should be stacked or placed in the sack as soon as the stalks begin to become brittle and care must be taken in handling that too many leaves are not knocked off as they are the best part of the hay crop.

The Seed Crop is ready to be harvested when the majority of the seeds are mature. The crop is then cut close to the ground as usual, but it is stacked loosely and allowed to dry out, the unripe seeds meanwhile ripening in the stack. When the crop has become thoroughly dry and brittle, the seeds are removed. It is also a general practice to have a piece of cloth under the stack to catch any seeds that may have shattered, since these are invariably the plumpest and best seeds of all.

One crop will produce from eight-tenths to two and one-half bushels of seed. Calculating this at the legal rate of 60 pounds

per bushel, one may expect to get from 48 to 150 pounds of seed per acre.

ROTATIONS.

Alfalfa, being a perennial, will continue to produce good crops for several years. In some regions it has continued to produce good crops for from six to 10 years, and in California there are fields 40 years old still producing good yields. However, this is generally the exception, for in most cases the field will begin to decline in yield after the fourth year, and it has been found more profitable to replant soon after the yields begin to decline.

All up-to-date farmers practice rotation of crops, for by this method the fertility of the land is maintained and insect pests, diseases and weeds are more successfully combated.

Corn and other crops are especially benefited by a rotation with alfalfa. On new weedy land it is best to plant first a crop of corn or potatoes, which will leave the land almost free of weeds and also in good physical condition. Alfalfa will do very well after a corn crop and, by means of the nitrifying bacteria by which it is accompanied, the alfalfa crop following will, at the end of its period of growth, leave the soil more fertile and in better condition for the next crop.

Various methods and crops are used in rotations according to the natural adaptability of the soil and climate, but the following systems may be worthy of consideration by the dairyman:

- (1) Corn one year; potatoes two years; alfalfa three to four or more years.
- (2) Corn two years; alfalfa four or more years; corn two years.
- (3) Corn one year; potatoes one year; soy beans or cow peas one year; corn one year; alfalfa four or more years.
- (4) Sorghum two years; alfalfa four or more years; corn one year; cow peas one year.

It may be well to mention here that in general a legume is made to follow or alternate in the rotation with a non-leguminous plant, the choice of the varieties or species depending upon the natural environment, requirements of the market or farm, and also the prevalence of certain weeds, insects and fungous diseases.

WEEDS.

As mentioned above, weeds are the worst enemies of the young alfalfa plants, the dodder, yellow trefoil, bur clover, green foxtail and others being the most serious ones in the States. We do not have these weeds to combat in Hawaii, but we have worthy substitutes in the so-called "knot or onion grass," "Honohono," and the purcelain or "akulekule" (sometimes also called pig-weed).

"Rhodes grass" has also been found a serious pest where alfalfa is planted in fields formerly devoted to it, owing to the prevalence and persistence of its numerous underground stems.

(To be Continued.)

THE KALO IN HAWAII (IX).

By VAUGHAN MACCAUGHEY AND JOSEPH S. EMERSON.

(Continued)

CULTIVATION OF KALO IN OTHER PARTS OF THE WORLD.

MADEIRA.

The cultivation of kalo in the Madeira Islands is described by Mr. David Fairchild of the U. S. Dept. Agriculture. He visited Funchal in March, 1907, and writes as follows regarding the "*Igname*" (Madeiran name for kalo): "According to one of the green growers here . . . these *Ignames* sell for 3 cents to 4 cents a pound, while sweet potatoes sell for only 2 cents. Crop comes in February and ends in April. Keep well; yield about one-third that of sweet potatoes; plantations continually watered; planting at all times of the year; side root stocks or tubers removed and the central stock left to form a perpetual plantation. The growers in the country boil the tubers before bringing them to market. Then they are brought down from the hills in baskets and sold in this boiled condition for 5 pence (10 cents) a pound. They are very palatable and nourishing, I believe, and rank here as more of a delicacy than the sweet potato. Only two kinds are known here so far as I have ascertained." (U. S. D. A. Bur. Plant Industry Bul. 132, p. 59.) The two kinds are the "*Branca*" or white, and the "*Vermelho*" or red variety. Mr. Fairchild reports that "there seems to be little preference given to either of these sorts . . . They are peeled or scraped, and then boiled three to four hours in salt water."

CHINA.

" . . . Seven species of the *Colocasia* are found native in Cochin China, two of which are edible ' ' . the *Colocasia indica* and the *Colocasia esculenta*, known to the natives as *Khoia mon sen* and *Khoia mon sap* respectively. The latter, which is by far the best species for food as well as in yield, includes two additional varieties, known as *Mon ding* and *Mon mink tia*. ' ' . The cultivation of the edible species should begin in March or April. They require a marshy soil and are planted in ridges like sweet potatoes, about 30 inches apart, with about twice that space between the ridges. Young offshoots from the bottom

of the plants are also used for plant propagation, and the time necessary to mature is six months. The tubers are eaten boiled, the same as the sweet potato, and a kind of flour is also made from them. The price is . . . less than seven cents a pound." Mr. J. E. Conner, American Consul, Saigon, Cochin China, May, 1908. (U. S. D. A. Bur. Plant Industry, Bul. 142, p. 35.)

SURINAM.

Mr. P. J. Cramer, Director of Agriculture, Paramaribo, Surinam, describes as follows the growing of various aroids (*Colocasia*, *Xanthosoma*, *Alocasia*), as follows:

"The aroids grown here for table use are wet-land crops insofar as they need more moisture in the soil than sweet potatoes and yams. They prefer a sandy loam with a thick layer of humus on the top, while a light shade is beneficial to their growth. On pure sand they do not thrive as well as the sweet potatoes and yams unless the ground is thickly mulched and lightly shaded.

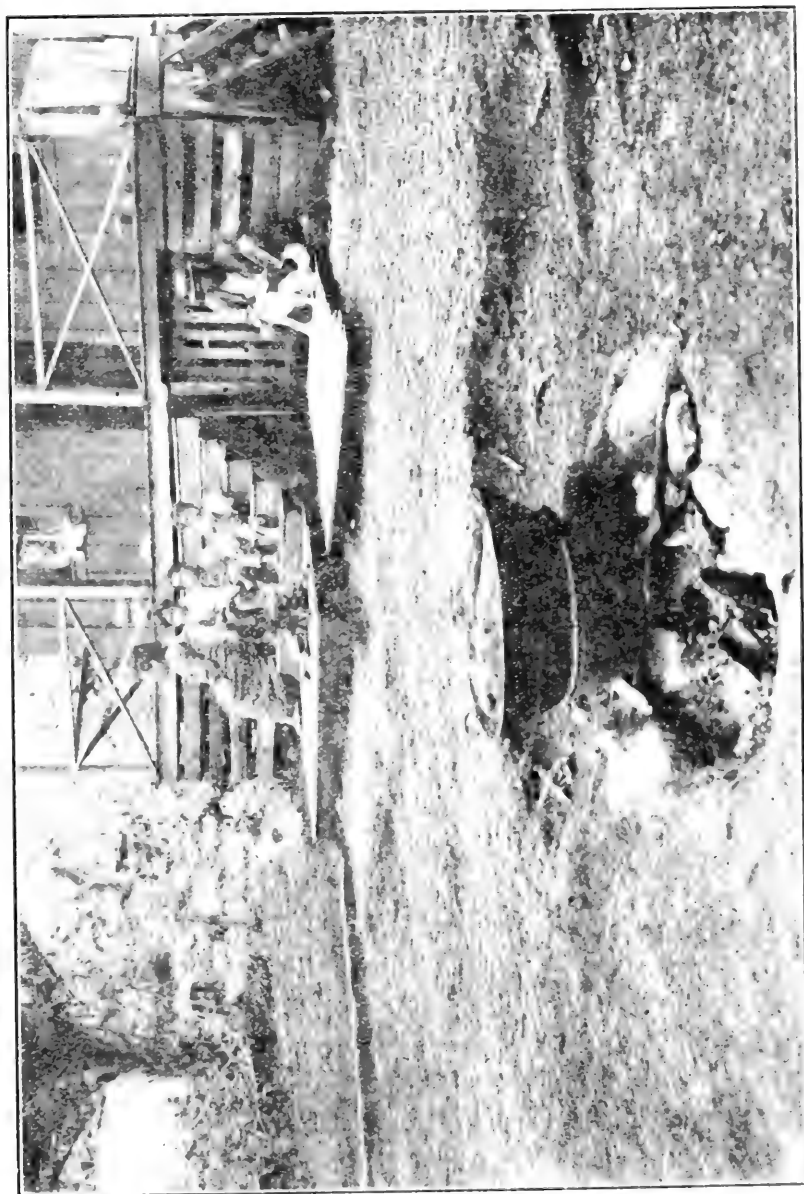
"The aroids are planted in Surinam the whole year through. They are never flooded, for during the greater part of the year sufficient moisture is kept in the soil by the rains, and in the three very dry months (September, October and November) fresh water for irrigation purposes generally is not available in the cultivated part (the coast lands) of Surinam."

The *Colocasia* chiefly raised is a dashcen, known to the natives as "Sinensie-taya." The corms and tubers are non-acrid; upon cooking the flesh of the corms becomes very white, that of the tubers slightly violet colored. It is regarded as a rather poor table vegetable, becoming soft and slimy when cooked. (U. S. D. A. Bur. Plant Industry, Bul. 233, p. 29).

FUNGI AND INSECTS.

The disease known as "taro rot" or "root rot" becomes prevalent when improper cultural methods are followed. The specific cause of the disease is not known. *Huli* cut from immature corms are especially liable to become diseased. The disease attacks the inner part of the corm, causing it to rot. Plants thus affected mature in an abnormally short time. The leaves develop yellow spots and are wrinkled in a characteristic manner. Planting *huli* from diseased plants; planting in fields where diseased plants have been recently grown; fertilizing with leaves from affected plants, and flooding the newly planted *huli* too soon,—these are common sources of taro rot.

The kalo plant is remarkably free from insect pests. It is occasionally attacked by plant lice, but the damage done is so inconsiderable as to be practically negligible.



COOKING THE KALO CORNS.

A crude method employed by Hawaiians nowadays instead of the old fashioned *imu*. Note the simple fire place; the kettle for steaming the corns composed of two old wash tubs; and the coarse burlap covering the corns. In the rear is a portion of a Hawaiian family.

THE MAKING OF POI BY HAND.

This method, employed by Hawaiian and Chinese poi-makers, is a long and arduous one. The kalo corms are cleaned of roots, washed, and cooked for several hours. The cooking is done in large kettles, or in an *imu*. The *imu* is the characteristic Polynesian under-ground oven in which food is cooked by means of water-vapor heated by hot stones. Previous to the introduction of iron kettles into these islands from abroad the natives had no means of boiling their food. All the cooking of kalo for poi was done in the *imu*, wherein it was steamed underground.

In constructing an *imu* a hole a foot or so deep and three or four feet across is dug and lined with stones. A few stones are then placed on the bottom, and covered with fire-wood. The wood is ignited, and small stones are put onto the fire, and become very hot. After the fire has consumed all the wood the heated stones cover the bottom of the *imu*. Ki leaves are spread over these stones, the corms are piled onto the leaves, and are covered with more leaves. A large stick or post is sometimes temporarily set up in the center to preserve a hole and then the *imu* is covered, *kawewe*, with leaves and earth. A quantity of water is poured into the hole, which is then closed. The heated stones convert the water into steam, which cooks the kalo. Kalo but partly cooked is *mo'a uno'a* or *unounoa*, and when pounded the parts are easily scattered, *puchuchu*. Kalo partially cooked, so that the uncooked portions appear as white spots, is called *puhaaa*. Half-cooked kalo in general is *mo'a kolckole*. Baked kalo is *ai kupuu*; a bundle of cooked kalo partially pounded is *holo ai*.

The time for cooking depends upon the amount of kalo put into the *imu*. It varies from one hour for a small amount to five or six, for an unusually large *imu*. The average time is two and a half hours. After the cooking is complete, the top or covering of the *imu* is removed, and the corms are taken out. The skin is scraped from the corms by means of shells, (*opihi* or patella shells being deemed especially suitable), sticks, or knives. In this state the corms, called *ai paa*, solid food, while fresh are much esteemed. The *ai paa* may be either dried or pounded.

Sometimes the *ai paa* were sliced up and dried in the sun, furnishing a convenient and portable food called *ao*, suitable for long voyages and comparable to hard-tack. According to Andrews' Dictionary, "Sea-bread or army hard-bread was called *ao* by Hawaiians when they first saw it."

POUNDING THE POI.

If the corms are to be made into *ai pa'i* they are put onto a poi tray or poi-board, *papa ku'i ai*, and pounded with stone pounders. This process is called *ku'i ai*, *kimo*, or *po'e*.

The poi-board is usually hewn from a single large plank, five



COOKING THE CORN.
 A deep core of the cooling-pipettes. The fire place is built of smooth porous lava boulders.

or six inches thick, 24 to 30 inches wide, and three to six feet long. Any hard, close-grained wood, that could be obtained in pieces sufficiently large, is suitable for a *poi*-board. *Kōa* and *ohia* were among the woods anciently used; to these in recent times has been added monkey-pod, mango and other introduced trees.

The short boards are used by men working alone; when the long boards are employed two men work together, one at each end.

The *poi*-pounder or pestle is fashioned from a piece of hard lava or coral rock, selected because of its proper weight and grain. It must be neither too heavy nor too light; it may be porous, but the vesicles must be small. In shape the pounder is like a thick, stubby pestle, the neck of convenient size to be gripped firmly by one hand; the face is markedly curved and very smooth. On the island of Kauai, other forms of *poi*-pounders were made, namely the ring-form, and the stirrup-form.

A small type of pounder, called *pohaku ku'i poi malū* was used by the common people in times of great scarcity, to avoid by the loud noise of pounding the preparation of food, lest others hearing should expect to share the *poi*.

This pounding of the *kalo* by hand, like the primitive methods of its cultivation, requires a large stock of patience, persistence, and muscular power. This work is always performed by the men; although the women participate in the subsequent mixing of the *poi*. The workman seats himself on the ground, his legs extended along either side of the *poi*-board. He has divested himself of all unnecessary clothing, in fact is usually nude to the waist, for it is important that the arms be perfectly free. At one side, close to him, is a pile of the cooked and cleaned corms, on the other side a container of water. The board immediately in front of him is well moistened with water, several corms are placed thereupon, and are mashed by short, quick strokes.

At every blow the pounder is lifted high in the air, the intensity of the blows increasing as more corms are added and the mass of partially pounded *kalo* gains in size. The face of the pounder is kept moist by water applied with the other hand between strokes. This prevents the *kalo* from sticking to the pounder. Corms which are tough are called *uana*. Those water-soaked are *loliloli*, or *popo*. Of these terms *loliloli* is most commonly used; *popo* is stronger and signifies entire rottenness. Corms decayed below but with an upper portion still fit to use as food are *palalalo*. The white spots that appear in *ai paa* while being pounded are called *a*.

AI PA'I.

A firm, dough-like mass is the result of this continuous beating. In this state it is called *ai pa'i*, and will keep unchanged for some time. When desired for storage or transportation the *ai pa'i* was made with a minimum amount of water, and was tied up in



CORNS OF TAVA READY FOR PEELING.

The burlap cover has been taken from the cooler, spread upon the ground, and the thoroughly steamed corns placed upon it, preparatory to peeling. Three different peeling tools are shown: an ordinary kitchen knife, largely used now-a-days; a bit of coconut shell; and two long, or patella shells, these latter being used in olden times.

ki leaves in bundles called *pa'i-ai* or *holo-ai*, according to the shape of the package. If of the ordinary shape, a flattened spheroid, they were called *pa'i-ai*, a bundle of food. These bundles are usually done up in *la'i*, ki leaves, but frequently an old flour bag was substituted when the *pa'i-ai* was to be sent to another island. When the bundles were somewhat larger and done up with greater care in the form of a cylinder, they are called *holo-ai*. Such bundles were usually covered with *la'i*, and often protected on the outside by a strong covering of *lauhala*, pandanus leaves. The valley of Waipio, Hawaii, formerly supplied the greater part of that island with *ai pa'i*. Much of this was transported by sea; often, however, the boats were unable to come to the shore on account of the high surf. At such times a score or more *holo-ai* were lashed together in the form of a raft and pulled through the waves to the boat waiting outside in the smoother water. So firmly were these bundles secured in their protecting envelopes that the food within was none the worse for the external wetting in salt water. When loaded on donkeys and mules the *holo-ai* was regarded as a more convenient form for packing than the ordinary *pa'i-ai*.

Loose bundles of *ai pa'i*, not properly secured, so that the poi escapes, are called *ponununu*. Sometimes the two bundles, *holo-ai*, put upon the pack-horse, do not properly balance each other and need to be readjusted. This lack of balance is called *oloolo*.

Before steamers had replaced the sailing craft of a former day the inter-island delivery of native food was often seriously delayed, and the *pa'i-ai* became *mahumahu*, that is parts of it were bad from exposure to the air, and it could not be made into good *poi*. The proper remedy in all such cases was to place the bundles of food in a native *imu*, and steam them over again. On taking them out they were in such condition that they were readily made into good *poi*. Often, however, the native food was so scarce and difficult to obtain that wheat flour was made into a thick paste, enclosed in a flour-bag and boiled. This was mixed in with native food and used as a substitute for pure *poi*. In extreme cases where *ai-pa'i* was not obtainable, wheat flour thus prepared without any admixture would be the only *poi* used for a long time. *Poi* is also made from breadfruit, sweet potatoes, and sometimes from pumpkins.

POI.

Poi is made by pounding *ai-pa'i* and adding water until it has acquired a smooth, fine-grained and somewhat fluid, *nouo*, consistency. Bundles of pounded *poi* made into soft poi were called *popo-ai* or *ai-lau*. *Poi*, which has been well pounded, so that it is fine without lumps, is *acac*, *wali maika'i*, or *nouo*. If not well pounded it is *puupuu*.

Hu means to rise or swell up, like new *poi*. *Wiliau* or *au*



CLEANING THE CORNS.

Four natives cleaning the corns; the women are dressed in *babuka*. Note the three metal vessels containing water, for washing the peeled corns, and the three wooden bowls, (*amoko*), for receiving the cleaned corns. The cooking process thoroughly softens the bark, so that it is easily removed.

means the circular motion of the hand in stirring *poi*. *Uuluhaku* means to stir *poi* like a lazy man, hence the *poi* will be lumpy. *Poi* that is not well-pounded and therefore full of lumps, which cannot be removed by careful mixing, is said to be *puupuu*, a much stronger term than *hakuuhaku*. When the lumps in *poi* are fine, like sand, it is *oncone*.

Mild acetic fermentation gradually takes place, so that the fresh, sweet *poi*, called *pololci* or *okaokai*, becomes slowly changed to the older sour *poi* or *poi auaawa*.

Among the Polynesians *poi* is universally eaten with the fingers. According to the amount of water with which it is diluted it becomes "one-finger," "two-finger," or "three-finger" *poi*, this criterion being that of the number of fingers required in eating it. When *poi* has been successfully pounded and mixed it can be readily transferred from the container to the mouth by one or sometimes two fingers. The act of transferral is called *miki*; the dextrous twirl given to the finger in the *poi* to make it adhere properly before carrying it to the mouth is *koai*. *Miki pakahi* indicates the use of one finger; *miki palua* the use of two fingers, and *miki pakolu*, the use of three fingers. If the *poi* is so thin as to require three or more fingers it is better form to fill a small *umcke* and pour its contents down into the wide-open mouth. This act is called *kau*, and is performed with great dexterity. The skill with which a well-bred chief was able to dispose of a large quantity of *poi* in one *kau* was called *miki oi*. Only a *kanaka hauka'i*, "a careless fellow," would use his fingers in eating thin *poi*.

If a person in eating from a bowl of poorly mixed *poi*, shuns the lumpy part and seeks out the better part, this action may be called *aloalo*, "dodging the lumps." When a person is too lazy to have his food properly prepared, or to clean his fingers before eating, or eats in a dirty manner and then leaves the food without care he is called *he kanaka pono-ai*, "one who eats like a pig."

Hoo-wali is the process of mixing *poi* with the hand in the calabash; *wiliau* is the final process of the *hoo-wali*. If the *poi* adheres to the side of the calabash after this mixing, the sides of the calabash are cleaned by a circular motion of the hand. This motion is called *kahi*, and is a conventional signal on the part of the host or hostess, at a meal, that the eating is at an end. To *kahi* before the guests have all finished is *pi*, mean or very bad form.

Thin, watery *poi* is called *kale*, *kakale*, or *kalckale*. *Piholoholo* is a thin kind of *poi* made for the sick; it is like the ordinary *poi* "cocktail" of the foreigner, save that it contains neither milk nor sugar.

UMEKE.

The *poi* was kept either in wooden bowls or calabashes. The bowls, *umcke*, were hewn from solid blocks, usually of *kou*, *koa*,



CLEANING THE CORMS.
A nearer view. Note the curved bit of coconut shell in the hand of the woman to the extreme left.

of the *ipu* family. They were sometimes very large, three or four feet in diameter, but the common forms were of moderate size. The highly polished bowls common in the curio stores now-a-days are not genuine antiques, but are either turned on lathes, or are old Hawaiian bowls that have been recently polished and finished in a manner wholly unknown to the ancient Hawaiians.

The calabashes or gourds were the prepared fruits of certain tropical vines. There were two species of gourd commonly cultivated by the ancient Hawaiians. The *ipu*, *Lagenaria vulgaris*, is the familiar "bottle gourd." This plant, according to Hillebrand, "is cultivated or naturalized in most tropical countries."

The hard, woody shell of the fruit served for containers in their households, while the largest gourds were converted into drums for use during their dances. The drastic pulp and seeds were a favorite medicine in the hands of the kahunas, although by no means free from danger."

The other gourd is *ipu nui*, *Cucurbita maxima*, and is the "calabash" or "large gourd." The Hawaiians were apparently the only people of Polynesia familiar with this gourd before the coming of foreigners. This fruit sometimes attains a diameter of several feet. These gourds were used as containers for *poi*, water, clothing, and other materials.

(To be concluded.)



IMPLEMENTS USED IN MAKING POI.

Observe the poi board; the stone pestle; the pail of water used in wetting the pestle and giving the poi the proper consistency; the *unake* filled with fresh poi. The mat is woven of pandanus (*huhu*) leaves.

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The records and maps of this division are available for inspection by any one who desires information relative to water resources, topography, etc. Blue print copies of hydrographic data relative to any stream, ditch, spring, etc., which may be under observation by this division will be mailed free of charge on request.

This division will also make ditch seepage losses and utilization investigations when the actual cost of the labor, meals, subsistence, transportation, etc., of each investigation is borne by those desiring the same.

G. K. LARRISON,
Superintendent of Hydrography.

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DIVISION OF ANIMAL INDUSTRY.

ANNUAL REPORT FOR YEAR 1913.

Honolulu, December 31, 1913.

The Honorable the Board of Commissioners of Agriculture and Forestry, Honolulu, T. H.

Gentlemen:—I have the honor to submit herewith my report as Superintendent of Animal Industry and Territorial Veterinarian for the year ending December 31, 1913.

As all routine and detail work has been recorded in the twelve monthly reports of my Division it has been my aim in this report to show the present status of live stock conditions in the Territory in order to emphasize what has been accomplished during the nine years I have had the honor to be the head of the Division of Animal Industry.

Very respectfully,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT OF THE TERRITORIAL VETERINARIAN—1913

THE LIVE STOCK INDUSTRY OF THE TERRITORY.

The year ending December 31, 1913, must be said to have been in most respects favorable to the live stock interests throughout the Territory. The prolonged drought of the previous year extended well into the spring or summer of 1913 and the feed on the ranges became very short, but with the improved water supply of nearly all the stock breeding districts the losses from this cause were comparatively small.

The vast increase in the consumption of beef and other meats, as a result of the great number of soldiers now stationed here, necessitated the importation of large amounts of beef and mutton from California, as well as from the Colonies, but the expected reduction in price from the removal of the duty on live stock products did not materialize, the foreign exporters advancing the

price in direct proportion to the reduction and pocketing the profit that was to have benefited the local consumers.

The past year has seen the sheep industry reduced to a considerable extent in favor of cattle raising, it being generally believed that many of the sheep ranges have been overstocked and consequently worn out, at least in so far as sheep are concerned.

No epidemic of any kind has occurred among either cattle or sheep, but for the first time in four years a considerable number of hogs have been lost from cholera, especially on the Island of Oahu, thereby necessitating the importation of butcher hogs from California. Previous to 1908 this Territory imported annually from 4000 to 6000 butcher hogs, and pork was always a very expensive meat on the local markets. Hog raising was consequently encouraged and urged at every opportunity by the federal, territorial and local live stock authorities until the production of hogs increased to the point when importations were no longer necessary. This condition lasted, as stated, for four years, or until the latter part of 1913, when a shipment of 200 hogs arrived here from Oregon. There is, however, little cause to believe that this condition will last for any length of time. The outbreak of hog cholera was under control shortly after its presence was definitely established, and were it not for the persistence of the infection for about six months after the last case had occurred in any locality it would soon have been safe for the hog raisers to begin to stock up again, at least with serum-immunized hogs. But, in any case, it has been demonstrated that hog raising is a very profitable business in this Territory, at least to the extent where cheap feed (hotel, mess or kitchen swill) can be obtained, and, further, that there is now a sufficient amount of that feed here to supply the local demand for pork.

Horse and Mule Breeding has taken an immense upward swing during the past few years and it is highly satisfactory to report that the past year has demonstrated the absolute fitness, or rather superiority, of locally raised horses for all the branches of the military service stationed here. About three years ago the cavalry began experimenting with Parker Ranch horses, first as polo ponies and then as regular mounts and officers' chargers, since which time about 200 head of horses have been purchased on various ranches on Hawaii and are giving great satisfaction. It may therefore be safely predicted that no more horses will be sent here for military purposes, but that the future needs of the regiments stationed here will be supplied by the local horse breeders. The only possible objection to such an arrangement might be the price asked for Island-bred horses, as there remain but few of the cheap cow-ponies of common-breed stock. All the larger breeders now use only pedigreed stallions of high class, and the colts and young animals are no longer left to care for themselves on the ranges at all times of the year, but are fed, broken and handled and, in fact, looked after and cared for, selected and classified

until they can hardly be called range horses any longer; and, as a steadily increasing percentage shows all the qualities and marks of high breeding seen in the blue grass regions of the States, it is obvious that they cannot be sold at the figures which prevailed five to ten years ago. As regards the health of the horse stock it must be said to have never been better. A few scattered cases of spinal meningitis—so-called—have occurred, on Maui and Mōlokaʻi principally, but beyond these there has not been one outbreak of infectious or contagious disease worth mentioning. Two cases of suspected glanders in the same stable were reported from Hawaii, but as this was in a neighborhood where glanders had not occurred for many years, and quite isolated, it is more likely to have been epizootic lymphangitis.

IMPORTATIONS OF LIVE STOCK.

The following numbers of different classes of live stock have been received through the ports of Honolulu and Hilo during the past year:

	Honolulu	Hilo
Horses	550	6
Mules	710	6
Cattle	93	42
Sheep	2	42
Swine	227	11
Dogs and cats	75	11
Poultry (crates)	1330	127

From the above table it will be seen that by far the greater number of live stock enters the Territory through the port of Honolulu. Direct importations to the Island of Maui are included in the Honolulu record, since they all arrive here first and are inspected before being passed on to Maui, for quarantine or otherwise.

Of the 1200 to 1300 head of horse stock which arrived here during the year by far the greater part, that is, more than one thousand, were for military purposes. Of the remaining number most were draft horses of medium quality, and finally a number of stallions and mares for breeding purposes. Among these must be mentioned an importation of six black Percheron stallions and mares for the Parker Ranch, which undoubtedly will put their mark on many of the coming generations of heavy draft horses for which this ranch is so justly noted.

Among the cattle imported must be mentioned a bunch of five "Dutch Belted" cattle, the first seen here of that breed, and which were purchased by Mrs. B. M. Allen at the California State Fair, where they were prize winners. There also arrived a number of good bulls of the beef breeds but not by far as many as the Territory needs. Quite a number of the larger ranch owners are

exceedingly slow when it comes to improving their herds through the purchase of high class pedigreed sires, and seem to think that the end may be gained as well through the use of one-half, three-quarter or seven-eighth cross-bred bulls, many of which can now be purchased here, and some of which are splendid individuals besides costing much less than pure-bred animals. These breeders, however, do not realize that such animals lack that unfailing breeding potency inherent in the pure-bred sire of an old established breed, and which makes even the first cross with a common-bred cow worth twice as much and mature a year earlier than the offspring of a cross-bred or common sire with the same class of mother. It may be argued that the local market does not call for such heavy beeves or for such large cuts as those resulting from 1500 lb. steers, but that is simply because the consumers have become used to the smaller cuts and never have had an opportunity to learn that the larger the cut the smaller the waste. Another discouraging feature in this connection is the present system of the wholesale trade in butcher animals, all of which are practically bought on the block, that is, after they are butchered, and very rarely on the hoof, as is done everywhere else. This throws the entire loss from shrinkage—from the time a steer leaves the pasture until it has been butchered, bled and well drained, in many cases more than a week—on the stock grower, and the quality of the carcass, so apparent in the live animal in the feed yard or on the range, becomes almost insignificant. Whereas, for instance, a bunch of high grade Hereford or Shorthorn steers in the stables averaging 1400 or 1500 lbs. would bring the top market price, say seven or eight cents per pound on the hoof, a bunch of fat common-bred steers of all colors but fairly even size and weighing about 1100 pounds would bring at best five to six cents per pound. In the local market, however, the ranchman ships his cattle to Honolulu, taking them off the pasture and after a strenuous trip landing them in the slaughterhouse pens, where they remain until butchered, getting nothing but dry hay and water, a procedure which is obviously much more trying on well-bred cattle than on scrub stock and, as stated, when the final deal is made the carcass of the latter will in most cases bring as much as the former and possibly be preferred on account of their smaller size, the larger carcasses being classified as stags even if they average a year younger than the others. So long as this condition continues there is little incentive for the progressive cattle raiser to improve his herd with expensive sires and only concerted action on their part for the sale of the live animals to be consummated either on the ranch before shipment or else immediately after arrival in Honolulu, will give the producer of high class beef his just dues, and help to elevate the live stock industry to the standpoint which the ideal climatic conditions and the almost total absence of diseases of live stock warrant.

QUARANTINE STATIONS.

In connection with the importation of live stock and the above mentioned absence of disease, it is worthy of note that the Board has done everything in its power not alone to guard against the introduction of infected animals, but also to facilitate the importation of valuable breeding animals and assist the progressive stock breeder in bringing such into the Territory with as little cost and inconvenience as possible. To this end two ports of entry besides Honolulu, that is, Hilo and Kahului, were during the past year provided with quarantine stations. The Hilo station cost nearly \$3000 and the Kahului Station about half of that amount, besides which the Board provided a permanent caretaker for each. Both stations are of solid construction and absolutely modern in so far as sanitation and hygiene, as well as comfort and convenience, are concerned. The old quarantine station at Hilo was at best a makeshift affair, while importations of live stock for the Island of Maui had to be quarantined, when required, at Honolulu, and were it not for the uncertainty engendered through the change in the national administration, these improvements would undoubtedly have seen a great increase in the numbers of draft and breeding animals imported. The observations made by this Division during the past eight years have however demonstrated beyond a doubt that so long as new centers of infection are prevented from gaining entrance it is possible to eradicate the infection already established here. The following section of this report, dealing with glanders, shows this most clearly and accentuates the necessity for continuing the policy of vigilance embodied in the Board's regulations requiring inspection, testing and quarantine of all live stock coming from or through a state, territory or country known to be infected with one or more of the numerous animal scourges from which the Territory now is free.

DISEASES OF LIVE STOCK.

Glanders. It is with considerable satisfaction that this Division believes itself justified in claiming that glanders, the most destructive of all equine diseases, has apparently been eradicated from the Territory, especially in view of the fact that the disease was very prevalent here when the Division was established about nine years ago, and that no indemnity has ever been paid for destroyed animals. This is a feat which the best live stock sanitarians have claimed to be impossible and one that has not been accomplished anywhere else in the civilized world. It must, however, be said that it would have been nearly as difficult here had it not been for certain natural, especially climatic, conditions and resulting circumstances, all of which tended to favor the efforts at eradication. The prime factor, however, was the exclusion of

fresh infection with horses and mules imported from or through California and other countries. Owing to the great distance of these Islands from the mainland, and to the absolute necessity of importing large numbers of draft animals from the nearest available market, that is, California, it seemed to have become a habit with horse dealers there to unload on Hawaiian buyers latent or obscure cases of glanders, taking it for granted that the diseased animals could not be returned and that, if returned, they would not be admitted to the State but would have to be destroyed upon return arrival. It seemed therefore to be perfectly safe to ship such animals to Hawaii, and, until the mallein test came into general use, there can be little doubt that many reactors found their way to this Territory. No wonder therefore that glanders spread through the local stables and pastures until over one hundred outbreaks per annum became the rule rather than the exception and that the losses from this disease alone at times aggregated \$30,000 per year.

With the establishment of the Division of Animal Industry in 1905 a check was immediately put upon the importation of infected animals, although it was not until the coöperation of the federal Bureau of Animal Industry was enlisted in 1907 that a complete stop may be said to have been effected. This policy of the Territorial Board of Agriculture and Forestry, to demand and obtain federal protection in the interstate shipment of live stock, was soon followed by other states and territories until at the present time it is universally employed throughout the Union, and the regulations of this Board pertaining to the importation of live stock have been adopted, and in some cases copied word for word, by a number of the States.

At the same time a vigorous fight against the disease within the Territory was inaugurated and this again led to the appointment of deputy territorial veterinarians on the principal islands, without which the creditable result, that is, the apparently complete eradication of the disease, could not have been accomplished in such a short time, and especially without the payment of compensation for destroyed animals. It is, of course, not impossible that the disease may linger in some out-of-the-way mountain valley or gulch or remain latent in some old "carrier," as was the case in Waipio Valley, but even so if another outbreak should occur it will soon be apprehended and suppressed, while the intradermal test with mallein is so easy and simple that all exposed animals can be located and rendered harmless with comparative ease.

Bovine Tuberculosis.

What has been said above in regard to glanders in horse stock may to a certain extent be repeated in so far as bovine tuberculosis is concerned. What has been accomplished here along the line of control, suppression and eradication of this fatal insidious disease of dairy cattle and the resulting improvement of the local

milk supply is unparalleled in any other country, state or territory where no indemnification is provided for the destruction of diseased cattle, and where the enforcement of sanitary regulations is in the hands of political employees.

Beginning four years ago with the tuberculin testing of the dairy cows of the City of Honolulu conditions were met of sufficient severity to discourage the stoutest heart, and, had it not been for the unfailing support of the leading dairymen and their willingness to sacrifice large numbers of their best animals, it is doubtful whether the present satisfactory state could ever have been reached or, at least, not until the milk consumers had been educated up to demand pure and wholesome milk for their children.

The first tuberculin test revealed no less than 32% of diseased cows among the Honolulu dairy herds, which figure was reduced to 24% when all the dairy cattle of the City and County of Honolulu, that is the Island of Oahu, were tested, and it cannot be disputed that had the test been postponed even one single year the question of eradication would have had to be abandoned and either pasteurization or the "Bang method" of gradual elimination resorted to. But as it was, by far the greater part of the 469 head of reactors to this first test belonged to three or four of the largest dairymen, who were financially able to bear the loss and who declared themselves willing or even anxious to have their herds cleaned up. There was consequently nothing else for the recalcitrants to do than to follow this step or else go out of the dairy business, as the milk consumers were quick to respond to the movement for sanitary dairies and clean milk and refused to buy from any dairy that was not declared clean officially, even though there was a slight advance in the price of milk from the clean herds.

In the latter part of 1910 (November), the intradermal method of testing was adopted, whereby the greater part of the objection to the work of eradication was overcome. This method, fully described in the previous reports from this Division, has proved absolutely satisfactory and is fully believed to be the only means whereby the universal eradication of bovine tuberculosis can ever be accomplished.

The second and third annual tests gave respectively 5.8% and 3.8% of reactors whereas the 1913 test, comprising 4444 head of cattle, gave only 119 reactors of which a great part were range cattle that had escaped the previous tests and about 1½% were actual dairy cows. All of these reactors were slaughtered without unnecessary delay and, whenever possible, examined post mortem. In every case did the pathological changes verify the diagnosis and prove the value of the intradermal method of testing. All stables where reactors were found were thoroughly disinfected and whitewashed, and these herds are now being submitted to the test every three months in order to apprehend any

case, that may still develop, in its incipency. In the meantime it may be said that the milk supply of the City and County of Honolulu, to all intents and purposes, is free from tuberculous infection and it is to be hoped that this good work which has only recently been inaugurated on the other islands, where deputy territorial veterinarians are located, will progress and meet with the same support from the public as has been the case here. Up to the present time the efforts of this Board to do its share in fighting the Great White Plague by suppressing the one source of infantile tuberculous infection that we know *can* be suppressed,—viz., the milk-borne infection—has met with but lukewarm support from the municipal authorities in this county and none at all in the other counties, while the Territorial Board of Health is doing splendid work all over the Territory fighting the spread of the disease among all classes and nationalities of the population. Whether the efforts of the Board of Agriculture and Forestry along these lines are of any actual value in saving human lives has frequently been disputed, but knowing as we do that children under five years of age are especially susceptible to the bovine tuberculous infection, so often contained in milk from tuberculous cows, the Board of Health was asked for statistics in regard to the mortality among children from tuberculosis in Honolulu as compared to the rest of the Territory, during the period of the last three years. The report received covers the number of cases, with the number of deaths, of all forms of tuberculosis among children under five years of age, in the entire Territory and in the district of Honolulu alone, and proves clearly that there has been a decrease in the number of cases in Honolulu since 1910, of more than 66%, or to one-third of the annual number of cases, while the number of deaths has decreased more than 75%, or to one-fourth of the annual number of deaths. On the other hand the number of cases for the entire Territory shows an increase of 40% and the mortality an increase of 80% per annum. These figures cover the period from April, 1910, to June, 1913, with a total of 102 cases of infantile tuberculosis with 90 deaths, of which number 50 cases with 35 deaths occurred in Honolulu. But whereas the last year, ending June 30, 1913, gave the entire Territory 36 cases with 32 deaths, the District of Honolulu had only 9 cases with 5 deaths, which warrants the conclusion that some extraordinary factor must have contributed to this immense reduction in the local prevalence of the disease which it would not seem far-fetched to attribute, at least in part, to the absence of the specific infection, the tubercle bacillus from the local milk supply, especially as milk forms such an important part of the food of children under five years of age.

By this inference it is not meant to take an iota of credit away from the splendid work done by the Anti-Tuberculosis League of Hawaii and the Territorial Board of Health, but an analysis of the statistics contained in the pamphlet published by the

League (Advertiser, December 20, 1913), shows a *reduction* in the death rate from tuberculosis of all classes and ages (1911-1913) of from 3.5 per 1000 to 2.7 per 1000 inhabitants, which makes the *increase* in mortality among children under five years of age except in the one district where non-tuberculous milk is available, so much more conspicuous, and forcibly accentuates the fact that the said pamphlet, entitled "Fighting the Great White Plague in Hawaii," in no place on its fourteen pages mentions either cows or milk or the danger of transmission of bovine tuberculosis to children with infected milk, but simply ignores the efforts of this Board to assist in the fight along the lines which are now recognized the world over, that is, the eradication of the tuberculous cow. This statement is made with regret as there can be little doubt that, had the League embodied in its educational campaign a single paragraph urging the necessity of providing the children with milk from healthy tuberculin-tested cows, the milk producers all over the Territory would long ago have been forced to clean up their herds and stables in spite of the lethargy of the various municipal sanitary authorities, and more than a few lives might have been saved.

To attempt to eradicate human tuberculosis while the children are being fed milk from tuberculous cows is futile. Consequently the first step must be the eradication of bovine tuberculosis, and that can only be accomplished by teaching the parents the danger of tuberculous milk. Pasteurization cannot be relied on, especially not home pasteurization. To protect the children the parents must therefore refuse to buy milk from any but tuberculin tested cows, guaranteed professionally or preferably officially, to be free from the disease and kept in sanitary surroundings. The first dairyman in Honolulu to receive a clean bill of health from this Board found the demand for his milk doubled within one month even though he advanced the price from 10 cents to 12½ cents per quart. There are at the present time few families left where tuberculosis has not claimed one or more victims, and no mother will, after once being taught the danger, willingly buy milk from untested or diseased cows if wholesome milk can at all be obtained for her children.

There is consequently no reason why any individual or any community should wait for official action in order to get clean milk. In every district or community there is at least one dairyman who has a clean herd or who is progressive enough to clean up his herd the moment there is any agitation for clean milk, and it may safely be said that an application from a dairyman to have his herd tested and cleaned up, addressed to the proper local authorities, would hardly be denied at the present time. If it should be denied there is still the practicing veterinarian, who, if he is at all progressive, is the one who should take the initiative in every district or community where the authorities are slow about attacking the problem.

Bovine tuberculosis must go first, but to await its eradication through the promulgation of laws, ordinances and regulations which necessarily must carry large appropriations to become effective is futile. Action must come from below and not from above. It therefore rests with either the consumer, the milk producer or the local veterinarian to start the ball rolling and, as it is the milk consumer who is to reap the greatest benefit from the improvement, it is only reasonable that the consumer should pay for it. And what would the cost amount to? An advance of one cent per quart of milk would in one year pay the full value of every tuberculous cow in the United States and besides leave a handsome profit for the producer as well as pay for the work of the veterinarian. In accordance with statistics furnished by the Hygienic Laboratory (Bulletin No. 56) of the U. S. Public Health and Marine Hospital Service there were consumed in the United States in the year 1900 (12th census) no less than 740,000,000 gallons of milk and cream by the urban and suburban population alone—that is, this enormous quantity was sold by the milk producers and did not include what was consumed on the farm and what was used in the manufacture of butter, cheese, condensed milk, etc. This amounts to about 23 gallons a year for each person. The consumption of milk in Philadelphia during the year 1905 was estimated at 23 gallons for each inhabitant or an average of half a pint per day for each person. The daily consumption of milk in Honolulu aggregates 6000 quarts, so an advance of one cent per quart would mean \$60 per day or \$21,900 per annum. This sum would, and probably has, fully reimbursed the milk producers in the City and County of Honolulu if taken as a whole, since the bovine tuberculosis work began in 1910, for losses sustained through the destruction of diseased animals, and it has been paid without objection by the milk consumers. It will therefore be seen that if the annual consumption of milk in Honolulu averages 23 gallons or about 100 quarts per head as in Philadelphia, the insurance against tuberculous infection through cows' milk would, at an advance of one cent per quart, have cost the consumers on an average one dollar per annum each.

In conclusion it may be stated that the intradermal test is slowly but surely gaining ground, at least four States using it officially and many others experimenting with it. In California it is now used almost exclusively by the live stock sanitary authorities, even though it is admitted that considerable practice is required before the veterinarian in general can be trusted with it.

Preventive Measures Against Rabies.

It is now nearly two years since the regulation requiring the quarantining of all dogs coming from or through territory infected with rabies went into effect.

While the measure has met with a considerable amount of more or less pertinent criticism it cannot be said to have been actually opposed and it is doubtful whether a single dog, if at all worth while, has been left behind on that account.

The actual number of dogs imported or arriving here with tourists or returning residents fell during 1913 to 75 head as compared with 106 during 1912 and 132 in 1911, but this reduction is due principally to an official order restricting the number of pets and mascots which usually arrived here with every regiment, company or troop that was to be stationed here. During the past year only officers' dogs have been allowed to accompany the various contingents of soldiers arriving here, thereby eliminating a great number of more or less worthless dogs which otherwise would have crowded the quarantine station for four months each. Another cause for the reduction is due in part to the strict six months' quarantine maintained in Australia and New Zealand which in conjunction with the local quarantine prevents theatrical companies, such as dog and monkey shows, from bringing performing animals to any of these countries or which at least makes it so expensive and annoying to the managers that they have practically abandoned the Hawaii, New Zealand, Australian circuit which formerly concluded such companies' tour of the world. In 1911 for instance more than 33 per cent. of the dogs arriving here consisted of soldiers' pets and performing dogs. That the dog quarantine regulation has proved effective in keeping the disease out until this time is very gratifying, especially when considering that the epidemic prevailing in the Pacific Coast States, so far from being suppressed, is constantly on the increase, and, while a number of attempts have been made to willfully circumvent the regulation and land dogs here regardless of the quarantine requirements, it is believed that no such attempt has so far been successful, and it is sincerely to be hoped that common sense will prevail among both tourists and resident dog owners and make them realize the awful responsibility they assume in attempting or conniving at the introduction of a dog without quarantine. The last case reported to the Board, from Hayward, California, where one rabid dog bit six persons, a couple of horses and more than twenty other dogs in less than an hour, before it was cornered and shot, furnishes a good illustration of what might happen in this dog-infested district, should the disease gain an entrance here. In the first place it would be necessary to establish a Pasteur institute here for the preparation of the vaccine and the treatment of bitten persons, a matter of several thousand dollars, and the employment of at least one expert scientist and assistant. California now has seven such official institutions and a number of private ones, in which hundreds of people are being treated annually. But before such laboratory and clinic could be established here it would be necessary to send all bitten persons to San Francisco, in many cases at public ex-

pense, and, owing to the distance and length of time required to get there—in some cases ten to twelve days—at great risk to the life of the patient. There is consequently every reason why this preventive measure of the Board, the dog quarantine, should receive the full support of the public as well as of the press. To recommend that a Pasteur laboratory be established here before the actual appearance of the disease would probably be futile, besides which it is a matter for the consideration of the Territorial Board of Health exclusively. But there can be no doubt that the disease *may* gain entrance here in spite of every precaution taken, and, if this calamity should occur, the question will immediately be raised, Why was nothing done in time, when we had the disease next door to us?

SUMMARY.

Summing up the results of the year's work it may be stated:

(1) That inspection and testing of all classes of domestic animals before or upon arrival here, and the enforcement of the various quarantine regulations, have again proved effective in preventing the introduction of any of the many diseases of live stock and other domestic animals so prevalent on the mainland of the United States or in its colonies and other countries.

(2) That glanders among horses and mules, which formerly caused a greater loss than all other diseases of live stock combined, has been practically wiped out, only one doubtful outbreak, affecting two animals, having occurred during the year, as compared to a hundred outbreaks annually a few years ago.

(3) That bovine tuberculosis has been reduced to a minimum among the dairy cattle in the City and County of Honolulu and bovine tuberculous infection removed from the milk supply in that district, which work coincides with a reduction of 50% in the mortality among children under five years of age from all forms of tuberculosis, as compared with an increase of 80% in the rest of the Territory where tuberculous cows are still being milked and the milk fed to the children (facts based on Board of Health records).

(4) That the eradication of bovine tuberculosis on the other islands is being pushed as fast as the deputy territorial veterinarians can do it and the local health authorities and the milk producers and consumers will furnish and support it, and finally—

(5) That the live stock industry of the Territory is prospering under the natural and unparalleled favorable conditions and unprecedented freedom from infectious and contagious diseases of animals, results and conditions which have placed the Territory among the leaders in live stock sanitary work and caused a number of States in the Union to emulate or copy the policies, methods and regulations of this Board.

Respectfully submitted,

VICTOR A. NORGAARD,

Superintendent of Animal Industry and Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

ANNUAL REPORT.

Honolulu, December 31, 1913.

Board of Commissioners of Agriculture and Forestry,
Honolulu.

Gentlemen:—I have the honor to submit herewith a brief report covering the various lines of work carried on by the Division of Entomology during the calendar year, 1913.

The principal and most important work of my Division during the year consisted of the usual quarantine inspection of all agricultural and horticultural products which were shipped into the Territory from the mainland and foreign countries. In addition to this work, a thorough inspection of all fruits, vegetables and plants going from the Island of Oahu to the other islands has been carried on during this period. There was also attached to this general work the introduction, care and distribution of several parasites of the Mediterranean fruitfly and the hornfly. This work, although connected with my Division, was under the direct supervision of W. M. Giffard, Esq., president of the Board of Agriculture and Forestry, and only on special occasions were my services required. The personnel of this branch, as well as a review of the work done, has been published in Bulletin No. 3 of the Division of Entomology, which Bulletin is in itself a complete report and was recommended by me for publication and appeared at the end of the year.

During the year the fruitfly control work by clean culture methods, as instituted by the Board of Agriculture and Forestry in November, 1911, has been continued by the Bureau of Entomology of the U. S. Department of Agriculture, of Washington, D. C., under the superintendence of Dr. E. A. Back, in charge of Mediterranean fruitfly investigations. He has also had direct charge of the inspection of all banana shipments to the Pacific coast. Results of this work will no doubt be reported by Dr. Back to the Bureau of Entomology and in due time will appear.

Staff.

During the first half of the year the staff of the Division of Entomology consisted of the writer as superintendent and chief inspector; Mr. D. B. Kuhns, assistant inspector; Messrs. Edward Drew, Robert W. Kakanui and Isaac Kahele, as assistants on the wharves. On June 3rd, 1913, Mr. J. C. Bridwell was appointed assistant superintendent of entomology. On account of the unexpected developments in breeding and distributing the introduced parasites of the fruitfly and owing to the difficulty of finding proper men for such work here, he was immediately de-

tailed to assist Mr. D. T. Fullaway, whose services were very kindly loaned to the Board by the Hawaii Experiment Station, in the multiplication and distribution of fruitfly and hornfly parasites. Mr. Fullaway was called away from the work during the month of October to take up some special investigation in the Philippine Islands and Mr. Bridwell then assumed charge of the breeding work of all the parasites to the end of the year. Brother Matthias Newell has continued as our regular inspector at the Port of Hilo, Hawaii, and the following gentlemen have served as honorary inspectors at the various ports on the islands. Mr. E. Madden, Mahukona, Hawaii; Mr. E. R. Bevins, Kahului, Maui; Mr. W. D. McBryde, Koloa, Kauai; Dr. W. D. Deas, Hana, Maui; Capt. C. F. Turne, Kaanapali, Maui, and Mr. G. C. Munro, Keomoku, Lanai.

Work Performed.

During 1913 we again note a slight increase in the arrival of horticultural products as well as in the number of vessels entering the Territory.

Including the port of Hilo, we inspected 565 vessels, of which we found 342 carrying vegetable matter, amounting to 13,586 lot shipments, consisting of 295,928 packages. Of this amount 288,679 were packages of fruit and vegetables, direct imports for home consumption, 1866 packages were seeds and 5385 packages were plants.

From these shipments, on account of infestations, 922 packages were destroyed by burning, 3850 packages were fumigated before delivery and 371 packages were returned to the shippers.

Rice and Bean Shipments.

All shipments of rice and beans from the Orient have been carefully inspected, not only for the rice weevil (*Calandra oryzae*), which species already exists on the Islands, but more especially for the rice moth (*Paralipsa modesta*), a very serious pest of stored rice and beans. Under a ruling of the Board of Agriculture and Forestry all rice shipments are fumigated at the port of Kobe, Japan, this being the port of debarkation for this product. I am pleased to report that of the enormous quantity of rice, 266,677 bags, which arrived in the Territory during the year, only 3100 bags of rice had to be fumigated at Honolulu.

During the year we were surprised to find a consignment of soya beans badly infested with the rice moth and I immediately notified all shippers to have all bean shipments destined for these Islands fumigated at the port of debarkation in Japan. In this matter I had the heartiest coöperation of the shippers and of the Japanese Merchants' Association. During the year 15,075 bags

of beans arrived in the Territory and of this number only 162 bags were found infested with the moth.

About the middle of November the Toyo Kisen Kaisha Steamship Company made Hilo a port of call for their South American run instead of Honolulu. This meant the arrival of all kinds of freight, including rice and beans, direct from Japanese ports to Hilo. The first steamer brought 6457 bags of rice and 110 bags of beans. As this was a new experience for the Hilo inspector I thought it best to oversee his work and accordingly dispatched Mr. D. B. Kuhns, my local inspector, to attend to this matter. The shipments proved to be free from both rice pests.

Equipment.

The equipment of the Division of Entomology has been added to since my last report. In 1912 I drew attention to the inadequate quarters that were at our disposal for fumigating large shipments of infested rice [see page 120 of the 1912 report], and recommended the erection of a large fumigating house for this purpose at that time. During the latter part of the year a very good fumigating house 20 x 30 feet, with 12 foot ceiling, has been built near Pier No. 7, that being the dock where all Oriental cargoes are unloaded. In building this structure the very best plans for economy as well as efficiency were used. Also, two vent doors, one at the ceiling line for light gases and one at the floor line for heavy gases, make our fumigation absolutely without danger to human life. We have had occasion to test this house and have had excellent results.

Through the kindness of the Board of Harbor Commissioners, I have had the privilege of changing my main dock office on Pier No. 7 from a small office under the staircase to the one which was formerly occupied by the harbormaster, near the main entrance to the dock. This is more commodious and has greatly assisted us in this important branch of our work.

As the port of Hilo is now in direct communication with the Orient and as there are no facilities for handling infested rice shipments should any arrive there, it becomes apparent that we shall have to provide a similar fumigating house at that port. I would, therefore, recommend that the Commissioners consider this important matter favorably and enable the building of the necessary structure.

The question is often asked why rice shipments are found infested, when all rice is fumigated at Kobe, Japan. In answer to this I will state that our observations in the past have demonstrated that these shipments can easily become infested in the hold of the vessel during the voyage from Japan here, because all rice shipments going to the mainland are not fumigated before leaving Kobe. Our shipments of rice are very often placed alongside or even on top of these shipments. For this reason the

weevils and larvae of the rice moth can readily crawl from one lot to another. So long as these conditions continue, the consignee at Honolulu or Hilo can hardly be held responsible for the infestation if there be any on arrival, especially when he has complied with the fumigation regulations in Japan. All bills of lading for shipments of rice coming to this Territory have government certificates of fumigation attached. I have recently taken up this matter with the Commissioner of Horticulture of the State of California looking to the possibility of that State requiring the fumigation of all rice shipments in Japan and he has promised to look into the matter.

Inter-Island Inspection.

The rule which was drawn up by the Board of Agriculture and Forestry for establishing Inter-Island inspection was passed at the time when the Mediterranean fruitfly made its appearance on the Island of Oahu and its intention was to keep the pest from spreading from that island to the other islands. Now that the pest has gained a foothold on all the islands we are more convinced than ever that other pests which might be accidentally introduced at Honolulu, the port of entry, should be closely watched. All plants, fruit, vegetables and soil, capable of carrying pests of any kind, have been closely examined during the year and whenever found infested have been refused shipment to the other islands. Especial stress has been put on soil attached to the roots of plants which were removed from the ground or recently potted. The constant finding of grubs and beetles and especially finding the larvae of nymphs of cicadas in soil from Oriental countries shows clearly the necessity of a very close inspection here. Should accidental introduction of such pests as just mentioned, or should any plant disease carried in soil, ever occur, we are in a position through the Inter-Island inspection to prevent their dissemination to the other Islands for some time at least.

During the year 716 steamers going from Honolulu to the various ports on the other islands were attended to and 13,658 packages were examined. These consisted of 4075 packages of plants, 9252 packages of vegetables and 330 packages of fruit. The bulk of the plants were nursery stock shipped by the Division of Forestry in the usual plant boxes, being young seedlings grown in sterilized soil. The bulk of the vegetables was taro for poi-making and it was thoroughly washed before shipment. The fruit was mostly imported fruit from the mainland. In all 326 packages were refused shipment on account of infestation or, in the case of plants, because questionable soil was attached. Owing to the rush of passengers at the gangway at time of sailing it has been our practice to inspect the staterooms and especially look through the steerage quarters before the gangway is lowered.

Everything has been done to make the Inter-Island inspection thorough and up to date as far as finances would permit.

Federal Horticultural Board.

On December 1, 1912, I received my appointment as collaborator of the Federal Horticultural Board, authorizing me to carry out the Federal horticultural quarantine and inspection laws, which became operative on October 1, 1912. After receiving my appointment I realized the necessity of having assistance in case of illness or absence from the port or the Territory and I requested the appointment of Mr. J. C. Bridwell and Mr. D. B. Kuhns as collaborators. They have both been appointed as such, which will materially strengthen our work.

Although since 1904 under the Territorial law all fruits, vegetables and plants have been regularly inspected upon arrival in the Territory, the additional powers we receive under Federal regulations have materially assisted us in regulating the unlisted small package, usually brought in by tourists or travelling friends of our citizens. Under the regulations of the Federal Horticultural Board it is compulsory for an importer or his agent to make formal application for a permit to import into the United States or territories any plants or parts of plants. All such shipments, therefore, which arrived here without a permit, and this included those brought by passengers, were refused entry by either being kept on board the vessel or destroyed after landing. These regulations assist materially in discouraging the promiscuous fetching in of plants by the travelling public. These plants, gathered at random and packed in all kinds of soil, moss or other material, are a great menace. It is usually this small package wherein lies the greatest danger and one of the main objects of the Federal Horticultural Board is to discourage this traffic.

It is very apparent from the appended list of pests which were taken from the various shipments coming into this Territory, that our occupation has kept us quite busy. There could be no better proof of what horticultural inspection means to our several industries. The keeping out of some of the most serious pests known in various parts of the world means that we may continue having profitable industries in our country and that whatever crops we may raise will not be injured and cause us great losses.

Respectfully submitted,

E. M. EHRHORN,
Superintendent of Entomology.

RECAPITULATION OF INSPECTION WORK.

Vessels inspected, Honolulu.....	466	...
Vessels found carrying vegetable matter, Honolulu . . . . .	...	282

Vessels inspected, Hilo.....	99	...
Vessels found carrying vegetable matter, Hilo	...	60
	<hr/> 565	<hr/> 342
	<hr/> <hr/>	<hr/> <hr/>

Disposal of Shipments, Honolulu.

	Lots	Packages
Passed as free from pests.....	10,925	256,169
Burned	613	911
Returned	14	183
Fumigated	110	3,850
	<hr/> Total, Honolulu	<hr/> 11,662
	<hr/> <hr/>	<hr/> <hr/>

Disposal of Shipments, Hilo.

Passed as free from pests.....	1,921	34,616
Burned	2	11
Returned	1	188
Fumigated	0	0
	<hr/> Total, Hilo	<hr/> 1,924
	<hr/> <hr/>	<hr/> <hr/>
Grand total, Hilo and Honolulu.....	13,586	295,928
	<hr/> <hr/>	<hr/> <hr/>

Fruits and vegetables inspected.....	288,679
Plants inspected	5,383
Seeds inspected	1,866
	<hr/> Total
	<hr/> <hr/>

Rice Shipments.

Passed as free from pests.....	263,277	
Fumigated on account of infestation.....	3,400	266,677
	<hr/>	<hr/> <hr/>
Beans passed as free from pests.....	14,913	
Fumigated on account of bean moth.....	162	15,075
	<hr/>	<hr/> <hr/>

Inter-Island Inspection.

Steamers attended	716
Packages of fruits, vegetables and plants passed.....	13,332
Packages of fruits, vegetables and plants refused shipment	326
	<hr/> Total packages inspected.....
	<hr/> <hr/>

Injurious Insects and Plant Diseases Intercepted Which Were Found on Shipments of Fruits, Vegetables and Plants Imported Into the Territory During the Year 1913.

Colcoptera or Beetles—*Cincindellid* larvae in stems of Orchids, Manila; *Carabid* beetle in moss packing, California; also 1 species found on wharf from California; these are beneficial. *Hydrophilus* species in soil on Iris roots, Japan; *Elatér* species in Banana roots, Manila; *Elatéria* larvae in soil on plants, Japan; these are very injurious to many plants. *Cerambycid* larvae in stems of ornamental trees, Japan. *Sylphid beetle* found on wharf; probably from California in commercial fertilizer. *Anomala* larvae in soil around plants, also larvae of *Melolontha* species and *Scarabid* species, probably several species were taken 5 or 6 times. *Chrysomelid* species, a leaf-eating beetle, in packing around plants from Sydney, N. S. W. Fleabeetle on Orchids from Manila. *Aracoceris* species in seeds of *Ziziphus trinerois*, Manila. The following weevils: *Bruchus prosopis* in Algaroba seeds from Arizona; *Bruchuschinensis* in beans and peas from Manila and Japan; *Bruchus pisorum* in Beans and Peas taken from Spanish immigrants from Gibraltar; *Balaninus* species in Chestnuts from Japan and U. S. A.; *Calandra granaria* in corn from the mainland; *Calandra oryzae* in Rice from China and Japan; a *Calandra* species in seeds from Sydney, N. S. W.; *Cryptorhynchus* species in seeds of *Heritiera littoralis* from Manila; *Sphenophoras* species in Banana roots from Manila; *Cylas formicarius* in Sweet potatoes and Yams from the Orient; *Acythopus aterrimus* in stems of Orchids, Manila; *Alphitobius piccus* in Banana roots, Manila.

Lepidoptera—*Butterflies and Moths*—*Anguimoid* grain moth, *Sitotroga cerealella* in Corn from the United States; *Isia isabella* larvae found crawling on potato bags from Seattle; *Scsiid larvae* feeding on the bark and roots of Gardenia from Japan; *Paralipsa modesta* in Rice and Beans from Japan; Larvae of moths on roots of plants from Japan; Codling moth in apples and pears from California; *Anarsia lineatella*, the Peachmoth, in peaches from California; Leafminers in Citrus leaves from Sydney, N. S. W.; *Lycanid* larvae and pupae on Orchids from Manila.

Hemiptera—*True Bugs*—*Cicada* pupae and larvae in soil on plants from Japan, also in soil and packing around Orchids from Manila; *Aradid* species injuring orchids from Manila; *Reduviid* species found crawling on the wharf, probably from California. The following *Aphis* species, *Macrosiphum sanboriun* on Chrysanthemums from California; *Macrosiphum rosae* on rose plants, California, and two species of *Myzus persicae* on carnations and *Cincarias* from California.

Coccidae or Scale Insects—*Aspidiotus rapax* on laurel and apples from California; *Aspidiotus cyanophylli* on Orchids, Eastern states; *Chionaspis* species on Hibiscus, Tutuila, Samoa; *Chrysomphalus bifomis* on Orchids, Manila; *Coccus hemisphae-*

ricum on *Ardisia crenilata*, Japan; *Coccus hesperidum* on Citrus, New York greenhouse; *Diaspis boisduvali* on Orchids, New Jersey nursery; *Fiorinia florinae* on Orchids, Java, and on *Strelitzia regina* from California; *Fiorinia* species on Orchids, Manila; *Lepidosaphes cocculi* on *Decudrobium*, Manila; *Lepidosaphes beckii* on Oranges, Florida; *Hemichionaspis minor* on Coconuts, Washington island; *Hemichionaspis aspidistrac* on Orchids, Sydney, N. S. W.; *Parlatoria pergandei* on Orchids, Manila, and on Rose plants, Japan; *Pulvinaria cammelicola* on Camellia, Japan; *Pseudococcus citri*, Orchids, Manila; *Pseudococcus pandani* on Palms, Samoa; *Pseudococcus azaleae* on Azalea, Japan; *Pseudococcus longispinus* on Palms, Sydney, N. S. W.; *Saissetia nigra* on Hibiscus, Samoa; *Saissetia olcae* on Palms, Sydney, N. S. W.

Formicidae or *Ants*—*Lasius niger*, *Prenolepis obscura* in soil from Japan; *Monomorium pharaonis*, *Tetramorium guineense*, *Dolichoderus bituberculatus*; *Prenolepis* species, *Ponericid* species in soil and packing from Manila; *Tetramorium guineense* in the roots of Palms, Sydney, N. S. W.; *Prenolepis imparis* and a *Myrmicid* species in soil, U. S. A. A *Ponericid* and *Myrmicid* species in baggage of immigrants from Gibraltar and a *Myrmicid* species in moss from England.

Diptera or *Flies*—*Ptectus* species, *Tipula* species and *Phorid* species in soil from Japan, *Phorbia brassica* in turnips from California and *Drosophilid* species in fruit from California.

There were also found Spiders, Millipeds and Centipeds in soil from Manila and other Oriental ports. Four species of *Mollusks* from Australia, Java and the Philippines and the following fungi: *Cladosporium citri* on Citrus, Japan, *Fusicladium dendriticum* and *pirinum* on Apples and Pears from California; *Cladosporium fructigenum* on Apples from Japan; *Oospora scabiei* on Potatoes from Pacific Coast; *Phragmidium subcorticatum* on Roses from United States.

DIVISION OF FORESTRY.

ANNUAL REPORT SUPERINTENDENT OF FORESTRY.

Honolulu, December 31, 1913.

Board of Commissioners of Agriculture and Forestry, Honolulu.

Gentlemen:—I have the honor to submit as follows a brief report covering the work of the Division of Forestry for the year 1913.

GENERAL SUMMARY.

Continuing the established policy now pursued for over a decade, the work of the Division of Forestry in 1913 was primarily directed to preserving and protecting the native Hawaiian

forest on the important watersheds throughout the Territory and to establishing on waste and other non-agricultural areas stands of valuable trees.

Several forest reserve projects that had for some time been pending were brought to final action in 1913 by the setting apart of additional sections of forest land on Oahu and Hawaii. As regards technical reservation of the land, the forest reserve system in Hawaii is now pretty well completed. Some scattered areas now wait to be brought within the boundaries to round out certain reserves, but taken by and large the belt of forest that is needed on each island to protect its water supply has nearly all been proclaimed as forest reserves.

The formal declaration that a given tract is a forest reserve does not of course exempt it from trespass. Such action is but a necessary step toward its adequate protection and proper administration. But it is in just this way that the year 1913 marks real advance. The action of the Legislature of 1913, in creating a special fund for forest and hydrographic work from the revenues derived from water licenses and leases, has made available for the first time since the organization of the forest reserve system in Hawaii funds for forest fencing and the active prosecution of other forms of protective work. Since July 1 several fencing projects have been got under way and preparation made under others for the inauguration of active work on the ground in the near future.

Along with the forest reserve work the Division of Forestry has continued its accustomed distribution of seedling trees, free and at cost, to individuals and corporations engaged in tree planting and as far as was practicable has carried forward the testing in the nursery and the propagation for subsequent distribution of plant introductions new to the Territory. Requests for advice on forest questions have increased in number and variety. In a quiet way a great deal of information is thus given out, which, in connection with the distribution of plant material, is of material assistance to local tree planters. It is a phase of the work that meets a growing demand.

Other activities of the Division of Forestry have followed the lines of former years. The forest fire organization has been kept up to date by the appointment of new fire wardens. During the year members of the staff responded to a number of calls to fight fires. Fortunately all the fires occurring in 1913 were stopped before serious damage had been done.

The following paragraphs outline briefly the points touched on in this summary.

Forest Reserves.

The list of the new forest reserves created in 1913 is as follows:

Name and Island	Total area acres	Area Gov't land, acres	Date of proclamation
Nanakuli, Oahu	1,010	1,010	June 4, 1913
Makua-Keauu, Oahu	4,716	4,376	" "
Knaokala, Oahu	434	434	" "
Kohala Mountain, Hawaii.....	29,627	14,204	Oct. 13, 1913
Upper Waiakea, Hawaii.....	51,800	51,800	" "
Upper Olaa, Hawaii.....	9,280	9,280	" "
Honolulu Watershed, Oahu.....	6,950	5,000	" "

On October 13, 1913, the boundary of the Moloaa forest reserve on Kauai was modified by the elimination of 83 acres and the addition of 34 acres, a net decrease of 49 acres. This action was taken on the basis of a recent survey, to straighten the boundary and exclude from the reserve a section of open land suitable for grazing and found not to be essential for water protection.

At the end of the year 1913 there were 34 forest reserves in Hawaii with a total area of 786,869 acres, of which 69 per cent. (540,877 acres) was land belonging to the Territory.

Forest Fencing.

The action of the Legislature, in setting apart the water revenues from Government forest lands as a special fund to be used for forest and hydrographic work, was one result of the long campaign that has been carried on by the Board for securing better provision for the protection of the native forests. In securing the final passage of the act, the efforts of a joint committee of the Hawaiian Sugar Planters' Association and the Board of Commissioners of Agriculture and Forestry played no small part. A comprehensive statement of the reasons why such a use of public moneys was justifiable, prepared by the chairman of that committee, Mr. W. M. Giffard, was printed early in the year. This statement also appeared as an appendix to the biennial report of the Board of Agriculture and Forestry, issued in March, 1913.

Under the terms of the new law (Act 57 of 1913) one-half of the revenues derived from the lease of water rights is devoted to forest work. The annual income for water rights is a little over \$66,000. The share for forestry is therefore \$33,000 per annum, an increase of about \$22,000 per annum over the amount which the Division of Forestry has had in recent years. Continuing the staff of the Division of Forestry unchanged and making the same provision as in the past for its routine work, the bulk of this money will be expended for the construction of forest fences on the boundaries of certain forest reserves where there remain gaps in the line, in the eradication of wild stock—cattle, goats and pigs—in other of the forests, and in planting areas of Government land with forest trees. During the six months period from June to December, 1913, fencing projects were got under way at Molokai, Kauai, and at Makawao and Nahiku, Maui. At the end

of the year calls for tenders were out for other fences at Ninole, Kau, Hawaii, and at Lualualei, Oahu, both of which projects were actually started in January, 1914. Much preliminary work was also done toward getting ready to let contracts on several other fencing projects.

In the way of forest planting actual work has been going on since July, 1913, on the replanting of the slopes of Mount Sugar Loaf on Tantalus Heights, back of Honolulu, with a stand of two native Hawaiian trees, koa and kukui. The area chosen for the first work was on the bare hillsides at the head of a valley tributary to the reservoir in Makiki that is now in use by the City of Honolulu for domestic supply.

Another planting project, continued during the last six months of 1913 under this fund, was in the Koolau district, Maui, where the work of caring for young trees set out by the Alexander & Baldwin interests on Government land was kept on, as otherwise it could not have been. This particular project consists of tree planting in areas along the lines of the ditches of the East Maui irrigation system, where the native Hawaiian forest suddenly died off a few years ago. The present planting is being done under a planting plan worked out by the Division of Forestry.

Administration of Forest Land Under Government Leases.

During 1913 a number of visits of inspection were made to Government lands in various parts of the Territory to see that conditions in regard to forest protection, fencing and tree planting were being carried out. Following conferences with the Land Commissioner an improved system of coöperation between the two departments was worked out, that should in future result in a better enforcement of the Government's requirements. The immediate result of the inspection visits was, in several instances, an increase of activity on the part of the lessee in pushing forward work on fences and in tree planting. So far as possible it is the policy of the Territorial Government to secure the construction and maintenance of fences on forest reserve boundaries as conditions under the lease of adjoining agricultural or grazing lands. Provision was made in this way in 1913 for the upkeep of the fences a good part of the way around the Kohala mountain on Hawaii and in other districts for the carrying out of needed forest work.

In several places, too, tree planting has been required on tracts leased for grazing in specified areas. Notwithstanding unfavorable climatic conditions in 1912 and 1913, the results of the planting under these leases is generally encouraging. Especial mention may be made here of progress under such auspices in tree planting on the Parker and Kukaiau ranches, Hawaii, and on the Cornwell ranch on Maui.

Forest Extension.

Mention has already been made of the giving of advice on forest matters to anyone in the Territory who desires such help. This function of the Division of Forestry has grown in importance with the passing years. As much of it is verbal in response to inquiries made in person at the Nursery, it is not easy to keep an exact record of how much is accomplished, but from the number of persons calling on the Division it is evident that such assistance meets a real demand.

It may be noted in passing that during 1913 many requests came from Army officers recently arrived in Hawaii who desired to do their part in making the new posts more comfortable and attractive than they found them.

As in former years, the distribution of seedling trees, free and at cost price to individuals and to corporations, has gone steadily forward. Especial efforts have been made to render it easy for homesteaders to get trees, particularly in such localities as the recently opened tracts at Haiku, Maui, and Kapaa, Kauai. At other times as well as on Arbor Day, there have been periods of free distribution, and even when a charge is made the price is so low that no one who really wants trees need have reason to go without.

The two sub-nurseries so far established by the Board on Hawaii and on Kauai continue to serve their respective localities. That at Hilo, under the direction of Brother Matthias Newell, takes care of the Hilo district and, now that the Hilo railroad extension is in operation, a portion of Hamakua as well. From the Homestead nursery on Kauai, under the direction of Mr. Walter D. McBryde, trees are distributed to anyone who applies on the lee side of that island. And from Honolulu shipments are made to other parts of the Territory as there is demand. Accompanying this report is a tabular statement prepared by Mr. David Haughs, Forest Nurseryman, giving the statistics of the plant distribution for 1913.

Experimental Planting.

Only the briefest mention can be made here of a subordinate but highly important line of work carried on by the Division of Forestry, the trial and experimental planting of trees of economic importance new to Hawaii. From various sources seed is received from time to time and started in the propagating houses of the Government Nursery. The plants are then cared for in the experiment garden in Makiki valley and finally distributed or planted out where they can be kept track of. During the latter part of 1913 there were received from Mr. Joseph F. Rock, consulting botanist of the Board, a number of consignments of seeds that had been personally collected by him in India, during a trip around the world.

In connection with the sub-nursery at Homestead some experimental planting of exotics has been done at the Papapaholohola Spring reserve. On Maui experimental forest planting in co-operation with the Division of Forestry is in progress at Kailiili, under the charge of Mr. W. Hannestad; at Wailuku, under an agreement with the Wailuku Sugar Co., and in Koolau, under the arrangement with the East Maui Irrigation Company already referred to.

The experimental plantation of eucalypts in Nuuanu Valley, Oahu, started with funds provided by the U. S. Forest Service, has now got to the stage when the little trees can take care of themselves. It may be regarded as established.

Forest Fires.

During the year forest or brush fires were reported from the following localities: Kapaa, Kauai; Waipio, Wahiawa, Pacific Heights and Kalihi Valley, Oahu; Pukoo, Molokai, and Ninole, Kau, Hawaii. In each case the fire was got under control and put out before it had resulted in serious damage.

New fire wardens were appointed during 1913, as follows: Island of Kauai: F. A. Alexander (Koloa), G. P. Wilcox (Kawaihou). Island of Oahu: H. Blomfield Brown, Geo. M. Robertson and Geo. Wilson (Waialua), C. J. Wheeler (Koolauloa) and Otto Ludloff (Koolaupoko). Island of Maui: Andrew Gross (Wailuku), A. K. Jones (Kahikinui). Island of Hawaii: Geo. Gibb (Kau), C. F. Eckart (Puna), D. S. Macalister and Alex. Morrison (Hamakua), and O. L. Sorenson (So. Kohala).

Publications.

The biennial Report of the Board and its several divisions for 1911 and 1912 was issued in March. As usual the divisional reports appeared also as separates, for distribution to persons and institutions interested only in particular phases of the work.

In June there appeared, as Botanical Bulletin No. 2 of the Board, a "List of Hawaiian Names of Plants," by Joseph F. Rock, consulting botanist of the Board. This list is compiled from Mr. Rock's volume, "The Indigenous Trees of the Hawaiian Islands," that appeared in June, 1913. Privately printed, under patronage, the field work on which this work was based was largely done while Mr. Rock was still actively on the staff of the Division of Forestry. The book is a highly valuable contribution to our knowledge of the Hawaiian flora and from now on will be looked to as the recognized authority in local dendrological questions.

Looking back at the year, nineteen thirteen may be regarded as the beginning of a new régime in the forest work of Hawaii—the time when education and propaganda gave place to getting actually under way in the forest on a scale large enough to be

worth while, the things that are necessary to a proper administration of its forests.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

DIVISION OF HYDROGRAPHY.

ANNUAL REPORT FOR THE YEAR 1913.

April 7, 1914.

Board of Commissioners of Agriculture and Forestry, Honolulu.

Gentlemen:—The following brief report of operations of the Division of Hydrography for the period July 1 to December 31, 1913, is submitted:

The Division of Hydrography was created by Act 56 of the 1913 Legislature on July 1, 1913, which provided that the present District of Hawaii of the U. S. Geological Survey, Water Resources Branch, should become a division of the Bureau of Agriculture and Forestry.

During the six months period a large amount of reconnaissance surveys have been made on all islands, preliminary to the outlining of a definite policy as to the carrying on of the work. All of these investigations were completed on December 31, and stream measurement stations have been selected on all streams and ditches to be investigated. The policy adopted in this connection is covered in detail in a special report under date of October 3, 1913. A further special report has been submitted on "Kauai Irrigation Projects" under date of November 6, 1913.

The field work of the Special Kona, Hawaii, Investigation authorized by Act 102 of the 1913 Legislature was practically completed. Stream and rainfall measurements will be continued during the calendar year 1914, after which the final report and estimate will be filed.

The following tabulation shows the status of all stream and rain gaging work during the period ending December 31, 1913. Attention is invited to the decrease in the number of stations. This is the result of the policy adopted to abandon all stations of which the records can not be of value in connection with present or future utilization and development. Since December 31 many of the discontinued stations have been replaced by permanent stations at locations where these records will be of value.

It is estimated that about three hundred stream and ditch measurement stations will be necessary to entirely cover the islands of Kauai, Oahu, Maui, Molokai and Hawaii.

Stream Measurement Stations.

Island	June 30, 1913	Established	Discontinued	Dec. 31, 1913	Measurements made at regular stations	Miscellaneous measurements made
Kauai	43	1	10	34	24	....
Oahu	27	....	6	21	70	42
Maui	48	6	15	39	77	17
Hawaii	87	....	87	....	1	6
Kona Investigation..	...	1	....	1	....	6
Total	205	8	118	95	172	71

In addition to the above records were furnished from private sources as follows: Kauai, 10; Oahu, 0; Maui, 17; Hawaii, 2; total, 29 stations.

Rainfall Measurement Stations.

Island	June 30, 1913	Established	Discontinued	Dec. 31, 1913
Kauai	28	....	....	28
Oahu	6	1	....	7
Maui	18	....	....	18
Hawaii	20	1	20	1
Kona Investigation .....	...	15	....	15
Total	72	17	20	69

In addition to the above records were furnished from private sources as follows: Kauai, 6; Oahu, 1; Maui, 16; Hawaii, 1; total, 34.

Evaporation Measurement Stations.

All of these were established between July 1 and December 31, 1913: Kauai, 4; Oahu, 3; Maui, 4; Hawaii, 0; Kona Investigation, 3; total, 14.

Very respectfully,

G. K. LARRISON,
Superintendent of Hydrography.

DIVISION OF ANIMAL INDUSTRY.

Honolulu, April 30, 1914.

Albert Waterhouse, Esq., President and Executive Officer, Board of Agriculture and Forestry.

Sir:—I beg to report on the work of the Division of Animal Industry for the month of April, 1914, as follows:

Bovine Tuberculosis Control.

As will be seen from the appended report of Dr. Case another test of the dairy herds of Honolulu has nearly been finished; that is, practically all, with the exception of the railroad ranches, have now been through the fifth test. The final result of 2.89% of reactors looks at first sight as an increase in the number of animals affected, but when the several thousand head of railroad ranch cattle is added—among which it is not expected that any, or at least very few, reactors will be found—the final percentage will be materially reduced.

As an example of the efficiency of the test it may be mentioned that one of the largest dairy herds in the county, but at the same time the one in which the eradication of tuberculosis was first begun, this time came through the test with a single reactor. While this animal was sent to the slaughterhouse immediately it must not be taken for granted that the herd, consisting of several hundred head, is now permanently free from the disease. In this mild climate the infection seems able to persist for a considerable length of time unless destroyed by repeated and effective disinfection, and even when this precaution has been taken the disease has been known to crop up again after two or even three successful tests have been passed.

This statement should not be considered as discouraging but on the contrary should stimulate every milk producer who has once got his herd cleaned up not to drop the work there but to continue the same vigilance against its recurrence as was taken towards its eradication, and in a community where the inspection and testing is done without any cost to the owners this cannot be considered a hardship, when a herd has once been cleaned up it cannot suddenly drop back to be a heavily infected herd, unless gross carelessness or criminal negligence is practiced by the owner or his employees. The immense importance of the subject, that is, the recurrence of tuberculosis in a herd once declared clean, may be understood when it is learned that one of the principal papers to be discussed at the annual meeting of the American Association of Medical Milk Commissioners, to be held at Rochester, N. Y., June 10-20, 1914, is entitled, "The Amount of Return Tuberculosis in Certified Herds," by no less an authority

than Dr. W. H. Park, chief of the hygienic laboratories of the Board of Health of New York City, the same scientist who was quoted in one of my recent reports as author of the statement that not less than 300 children die annually in that city from tuberculosis of proved bovine origin, the infection in every case being traced to milk from tuberculosis cows.

While by far the greater majority of milk producers in Honolulu have got their herds cleaned up so far as tuberculosis is concerned, there has at the same time occurred a distinct relapse in the amount of care and cleanliness employed in a number of the local dairies. This applies to animals as well as to premises, and, so far as the milk is concerned, to utensils as well as to methods; in short the present form of milk inspection in the city and county of Honolulu cannot be considered anything but a farce. When to this is added an unfortunate tendency on the part of a few dairymen and cattle dealers to traffic in condemned tuberculous cows it will be seen that the ultimate complete eradication of bovine tuberculosis cannot be expected in the immediate future, unless more drastic measures be adopted.

There still remains, even in the heart of the city, private herds or individual family cows, that have never been tested and which the owners object to having tested. Such animals remain a menace to all the milk producers, not alone in the immediate vicinity, but, through trade and transfer, to every part of the city and county, who have earnestly endeavored to eradicate the disease from their herds, and they certainly are entitled to protection as much as the general public are entitled to clean milk. Filthy stables and unsanitary methods and milk rooms can only serve to keep the infection alive while diseased animals may spread it promiscuously in being transferred from place to place.

An animal which has reacted to the tuberculin test can under the statutes of Hawaii and the rules and regulations of the Board of Agriculture and Forestry, as well as those of the Board of Supervisors, neither be used for dairy purposes nor any other purposes, nor be sold or exposed, but can only be taken to the slaughterhouse or otherwise destroyed under competent supervision, and, if the carcass is passed as fit for human consumption, it can be sold as beef. Consequently anybody who purchases or sells a reacting animal and disposes of it in any other way is violating the law and must take the consequences.

The statistics of the Board of Health as well as of the Anti-Tuberculosis League have fully demonstrated that infantile tuberculosis has diminished to a considerable degree in the city of Honolulu since the eradication of bovine tuberculosis was practically accomplished—that is, in other words, a number of human lives is annually being saved as the direct result of the work of this board, which should be sufficient to put a stop to any interference with or obstruction of such work. And now that we are approaching the warmest season of the year, when milk deterio-

rates twice as fast as at any other time, there is every reason why the local milk regulations should be complied with and their enforcement placed in efficient hands.

The improved method of testing mentioned in last month's report whereby the injection is being made under the eye instead of under the tail continues to give highly satisfactory results, and will undoubtedly be adopted wherever it becomes known. Photographs showing the pronounced reaction resulting from this new method of injection are appended hereto and, while not every reaction is as pronounced as two of those shown, it may be said that the smaller one (the black animal) shows an average reaction, which in all cases is very plain.

Respectfully submitted,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, April 31, 1914.

Dr. V. A. Norgaard, Chief of Division of Animal Industry.

Sir:—I have the honor to report as follows on the work of the month of April, 1914:

Tuberculosis Control.

	T.	P.	C.
J. M. Whitney.....	13	13	0
J. H. Cummings.....	7	7	0
H. Focke	7	3	4
F. K. Makino.....	2	2	0
M. Quintal	6	6	0
S. Tsumoto	8	8	0
Lunalilo Home	19	19	0
B. M. Allen.....	17	15	2
Dr. Straub	17	15	2
F. Valph	7	7	0
F. Correa	12	12	0
W. P. Louis.....	3	3	0
K. Oshiro	11	11	0
M. Kawamura	7	7	0
Geo. Wond	28	28	0
Kamehameha Schools	48	47	1
C. J. Day.....	4	4	0
D. Tello	2	2	0
J. P. Mendonca.....	9	9	0
Geo. Holt	27	18	9
S. M. Damon.....	320	317	3
Y. Nakamura	4	4	0
S. Boyama	5	5	0
I. Morioko	20	20	0

The above table gives a total of 603 head of cattle tested out of which number 582 were passed and tagged and 21 head condemned and branded. Up to the present time 2490 head of cattle have been tested with the result that 72 head or 2.89% have been found diseased and consequently condemned and branded. This is a decrease of 1% from the amount of disease present in the same district last year.

Importation of Live Stock.

S. S. Lurline, San Francisco: 15 horses, Hawaiian Pineapple Co.; 8 horses, A. W. Eames; 1 dog, Mrs. Belle Bucklin; 5 Berkshire hogs, Cornwell Ranch; 20 crates poultry.

S. S. Wilhelmina, San Francisco: 32 crates poultry; 1 dog, Mrs. L. Mathew.

S. S. Sonoma, Sydney: 1 dog, Mrs. E. Adams.

S. S. Missourian, Seattle: 169 butcher hogs, A. L. Macpherson.

S. S. Niagara, Sydney: 1 dog, Mr. Harvey.

S. S. Manoa, San Francisco: 22 mules, Schuman Carriage Co.; 21 cows (grades), 2 calves (grades), 1 bull (Holstein), 1 bull (shorthorn), 3 horses, 26 crates poultry, Charles Bellina; 8 crates poultry.

S. S. Matsonia, San Francisco: 2 crates poultry, 2 pigs, A. Zumstein; 10 crates poultry, G. S. Mackenzie; 5 crates poultry, Sing Sing.

Respectfully submitted,

LEONARD N. CASE,
Assistant Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

Honolulu, April 30, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the work performed by the Division of Entomology for the month of April, 1914, as follows:

During the month 36 vessels arrived at the port of Honolulu, of which 26 carried vegetable matter and 2 carried moulding sand.

<i>Disposal</i>	<i>Lots</i>	<i>Parcels</i>
Passed as free from pests.....	648	17,712
Fumigated	33	7,771
Burned	62	91
Returned	8	21
Total inspected	751	25,595

Of these shipments 25,301 packages arrived as freight, 177 packages by mail and 117 packages as baggage of passengers and immigrants.

Rice and Bean Shipments.

During the month the usual quota of rice and bean shipments from the Orient was thoroughly inspected. Thirty-two thousand five hundred seventy-six bags of rice and 2357 bags of beans arrived which were found free from pests and allowed to land.

Pests Intercepted.

Forty-eight packages of fruit and 23 packages of vegetables were found in the baggage of passengers and immigrants from foreign countries, all of which, being prohibited from entry, was seized and destroyed by burning.

Three packages of plants and 3 packages of seeds arrived by parcels post from a foreign country and, under the ruling of the Federal horticultural board, were returned to the shipper by the postmaster.

The Luka brought a cargo of coconuts (about 4000) and by previous arrangement they were turned over to us for treatment. They were fumigated in the large fumigating house on Kilauea street in the usual manner and more particularly as a precautionary measure. A few of the nuts had indications of the work of *Lepidopterous* larvae, feeding in the old, soft fibre. Probably it is the same species we have here.

A large package of Japanese sugarcane came by mail from Florida. I found it infested with the fungus *Colletotrichum falcatum*, kindly determined for me by Dr. Lyon, and ordered it burnt in Lucas' mill. The party receiving it lives on Maui and saw an advertisement in a paper that this kind of sugarcane is good for forage. Through the kindness of the H. S. P. A. she will receive a good supply of Japanese sugarcane in a few weeks.

Three hundred twenty-five cases of apples had to be overhauled on account of containing larvae of the codlingmoth between the ends and sides of the boxes, the fruit being in excellent condition and free from worms. I have notified the shippers of this condition and I have warned them that in the future such shipments will be either returned to them or destroyed. Fifteen boxes of apples were infested with codlingmoth and were returned to the Coast.

A case of hibiscus cuttings and one of growing ginger arrived by the S. S. Sonoma from Samoa and not having the necessary permit from the Federal horticultural board were ordered destroyed. The hibiscus cuttings were infested with two scale insects, *Saissetia nigra* and *Chionaspis mussaendae*; the ginger with a mealy bug.

Another case arriving from Singapore containing orchids was also ordered destroyed, not having the required permit from the Federal horticultural board.

A box containing some roseplants and geraniums arrived from the Coast; the geraniums were infested with the Greenhouse white fly, *Aleyrodes vaporariorum*, and were fumigated before delivery. The following insects were taken from a shipment of orchids from Manila: Two species of ants in the packing and around the roots of one plant. One plant infested with a scale insect, *Lepidosaphes cocculi*, the orchid borer (*Acythocephus atterrinnua*), 2 species of weevils in the larvae, some *capsids* and three species of beetles—a *Dytiscid*, a *Carabid* and a fleabeetle, crawling about in the packing. Shortly before the sailing of the S. S. Nippon Maru on April 9 one of the U. S. immigration officers found two caterpillars crawling on the coatsleeve of the interpreter. One of the ship's plants probably was infested with the pest and passing by he must have brushed against it and dislodged the caterpillars. It was too late to examine the ship's plants but the two caterpillars are in the cabinet of the division. This goes to show how easy it is for pests to be carried ashore without being contained in a shipment consigned to this port. Plants used as table decorations on board ship are often found infested with various pests.

The ship John Ena with coal and moulding sand was sent to Pearl Harbor direct. After notifying the authorities of the soil regulations they notified us when the sand could be examined. It proved to be the ordinary moulding sand and was allowed to land.

Beneficial Insects.

Several lots of Japanese beetle fungus were distributed during the month. Also a colony of ladybirds which Mr. Fullaway brought from Manila. He has liberated several colonies in various places. These are supposed to feed on mealybugs.

Four packages of dungfly parasites arrived from Dr. Silvestri. These were staphylinid beetles which feed on the larvae of all dungflies, the housefly, stablefly and possibly the hornfly. Upon arrival all live beetles are taken from the material and placed in manure containing housefly larvae. All material is thoroughly fumigated and then destroyed by burning, lest there be some eggs or a germ which might accidentally bring a new pest into the country. A thorough record is kept of every shipment, its condition on arrival and where distributed.

Hilo Inspection.

Brother Newell at Hilo reports the arrival of eleven steamers, six of which brought vegetable matter consisting of 132 lots and 2408 packages. All of these were found free from pests and were passed.

Inter-Island Inspection.

During the month of April 54 steamers plying between the islands were attended to and the following shipments were inspected:

Plants	59 packages
Taro	418 bags
Vegetables	19 packages
Fruit	18 packages
<hr/>	
Total passed	514 packages

The following packages were refused shipment on account of being either infested with pests or having objectionable soil attached to plants:

Plants	14 packages
Fruit	3 packages
Vegetables	1 package
<hr/>	
Total refused	18 packages

Respectfully submitted,

E. M. EHRLHORN,
Superintendent of Entomology.

DIVISION OF FORESTRY.

Honolulu, April 30, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I have the honor to submit as follows the routine report of the Division of Forestry for April, 1914:

FENCING OF FOREST RESERVE BOUNDARIES.

During the first week of April I made a quick trip to Hawaii to inspect the forest fence at Ninole, Kau, going over from Hilo with the contractor, Mr. C. H. Will. This fence follows the mauka line of the Ninole homesteads and is designed to close an unprotected gap in the forest boundary between the protected forests above the Hawaiian Agricultural Company lands and the Hutchinson plantation.

Towards the end of the month, under an agreement between Mr. J. Frank Woods and the Government to unite in the building of a fence along one course of the Kohala Mountain

forest reserve boundary, between the lands of Kawaihae 1 and Waika, in North Kohala, Hawaii, Mr. F. W. P. Bluett was instructed to run out and clear the line on the ground. This fence will protect the Kohala mountain on the west by filling in the gap between the Honokane gulch and the corner of the forest reserve fence that now runs across the face of this mountain. Work on the fence itself will be begun in the near future.

Progress is reported on the other fencing projects now under way under the auspices of the board above Lihue, Kauai; at Nahiku, Maui, and at Lualualei, Oahu. Dr. J. H. Raymond reports that the fence around the Polipoli spring in the Kula forest reserve, Maui, is being repaired and that it should be completed within a month.

Finding that dairy cattle from Palolo were working up the ridge between Palolo and Manoa, a short stretch of temporary fence was put up across the top of the ridge by employees of this board on April 21. This will serve to prevent stock from getting mauka into the thick forest until such time as a proper fence can be built on the line between the lands of Wailupe and Pukele (government). Negotiations for this fence are now in hand. With this exception the Honolulu Watershed forest reserve is not anywhere in danger from cattle.

TREE PLANTING.

Homestead, Kauai.

A report recently received from Mr. Walter D. McBryde in regard to the plant distribution during 1913 from the Division of Forestry nursery at Homestead, Kauai, shows a total of 6500 trees given out for that calendar year. In addition 12,044 trees were planted in the Papapaholahola Spring reserve. This number includes several species of eucalypts, koa, silk oak and Japanese cedar, all of which "have made a most satisfactory growth, due in part to the fact that all land to be planted to trees is first given a good plowing and just prior to planting is well harrowed.

"A good road has been built to the Spring reserve by the county, making the same accessible to those desirous of getting trees from the nursery. The road within the reserve itself was built from moneys received from the department." The value of this sub-nursery is yearly becoming more apparent. It is a decidedly useful institution.

Kukaiau Ranch, Hawaii.

Under the terms of four Government leases, tree planting is required on certain of the Government lands that form a part of the Kukaiau ranch, Hamakua, Hawaii. During the last week of April I made a thorough inspection and count of the tree plots, finding the work well in hand as to the number planted, and the

young trees satisfactorily established. Three of the leases require that the tree planting shall be done during the first five years of the term; on the fourth, during the first eight years. With the exception of two plots which are to be completed during the next month, the required number of trees has been set out.

Notwithstanding delays, setbacks and losses caused by the dry weather during 1912 and 1913 the work is now up to date, the blanks in some of the earlier planted plots caused by the trees dying having recently been filled in. This tree planting was started by Mr. Robert Horner when he was manager of the ranch. For the past two years it has been carried on by his successor, Mr. Donald B. Macalister.

Kona, Hawaii.

On April 30, a lot of 2000 sugi seedlings (Japanese cedar) was shipped to Mr. L. Macfarlane, manager of the Captain Cook Coffee Co. of Kealahou, Kona, Hawaii, to use in extending a stand of this tree begun two years ago. Sugi (*Cryptomeria Japonica*) has proved itself to be well adapted for use at the higher levels in this Territory. This particular plantation should serve not only as a valuable asset to its owners, but also as a good object lesson to other land owners in Kona. Sugi is a valuable timber tree that deserves to be more generally planted in Hawaii.

ADVICE AND COOPERATION.

Pursuant to the established policy of the Division to give advice on forest matters, I visited the Bishop Estate land of Heeia, Oahu, on April 13, at the request of Mr. G. H. Gere, agent of that estate, further to consider on the ground questions of tree planting and forest fencing. Other cases in which the Division of Forestry has rendered aid to the public in this manner are listed in the report of the forest nurseryman, which as usual is submitted herewith.

FOREST FIRE.

On the afternoon of April 10, the staff and four laborers of the Division of Forestry reported to a call to fight fire above Lot No. 9 of the Palolo homestead tract. This fire originated in the escape of a small bonfire from the dooryard of the occupant of the lot, Manuel Souza. Getting into the dry grass it ran up to the ridge on the east side of Palolo valley, burning over some 10 to 15 acres of grass and brush, and killing some thickets of ti and a few koa trees. Through the efforts of Mr. Souza it had been got practically under control by the time we arrived, so that our work consisted in putting out the smouldering embers that might have again been fanned into flame by a rising wind.

For speedy transportation to this fire the Division of Forestry is again indebted to the Division of Hydrography, Mr. Larrison

having put his automobile at our disposal and taken our party to the nearest practicable point for attacking the fire.

Under the date of April 15, I renewed, as chief fire warden, the special warning that has now been in force for some years, forbidding the burning of brush on Tantalus heights and on the Kalawahine ridge unless a permit is first obtained. The new period runs until June 30, 1915.

ROUTINE WORK.

As usual considerable time was spent during the month in routine administrative work, including the preparation of several short special reports on various matters that have been submitted to the Board. The report of the forest nurseryman contains additional details regarding the plant distribution work.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, April 30, 1914.

R. S. Hosmer, Esq.,
Superintendent of Forestry.

Dear Sir:—I herewith submit a report of the principal work done during the month of April, 1914:

Nursery.

Distribution of Plants.

	In seed boxes	In boxes transplanted	Pot grown	Total
Sold . . . . .	.....	351	31	382
Gratis	1000	1050	898	2948
	<hr/> 1000	<hr/> 1401	<hr/> 929	<hr/> 3330

Collections.

Collections on account of plants sold amounted to \$8.20.

Plantation Companies and Other Corporations.

The distribution of trees under this heading amounted to 400 pot grown.

Experimental Garden, Makiki.

The work at this station consisted principally of the usual routine work, mixing and sterilizing soil, transplanting trees, etc.

Honolulu Watershed Planting.

The work on the face of Sugar Loaf is progressing. Four hundred seventy-four kukui trees and 175 koa trees were planted during the month. Other work done consisted of clearing off and making holes, also hoeing the trees first planted.

Advice and Assistance.

The writer, at the request of a number of people, paid visits and answered inquiries as follows:

Calls made in and around city, 4; advice by telephone, 5; advice given at nursery, 4; letters of advice to other islands, 6.

Respectfully submitted,

DAVID HAUGHS,
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

May 11, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the division of hydrography during the month of April, 1914, is submitted:

Oahu.

Stevens automatic continuous registers were installed on the new stations on the Haiku, Kahana, and Punaluu streams. Alterations were made to the concrete measuring weir on the Nuuanu stream, and a shelter was constructed to house the new Bristol water register which has been loaned by the College of Hawaii. Two new converted Watson continuous water register stations were established on the east and west branches of the Manoa stream.

Two coöperative staff gage stations were established on the Waiahole stream to show the developed water in the Waiahole tunnel. All costs incident to the establishment of these stations was borne by the Waiahole Water Co. The regular station on the Waiahole stream was also improved, and three stations in the Kailua valley were repaired. The regular station on the Poha-

kea stream was discontinued as sufficient data have been secured to rate this stream.

In addition to the above 19 measurements were made and six rain gages were read.

From April 29 to May 1 a reconnaissance was made of the streams in the vicinity of Haūula, and tentative arrangements were made to establish from four to six coöperative stations for the Laie and Kahuku plantations. It has been proposed that, if the plantations will purchase and install the necessary equipment and materials, this division will furnish the supervising engineer and will rate the stations. Should this arrangement be consummated all windward Oahu streams will be under investigation, except the Waianu, Waikane, Kahaluu, Waihee, Kaalaea, Kaulanui, and Kaipapau streams.

An abundance of rain fell on Oahu during the month, and all surface and underground storage was well replenished.

Kauai.

Little was done on Kauai during the first part of the month as Mr. Hardy left Waimea April 1 and Mr. Dort, his successor, did not arrive until April 16. During this period Mr. Horner spent all of his time constructing the new trail to the new Lumahai station. This trail was completed on April 30. The latter part of the month was spent on general maintenance and construction work on windward Kauai.

Six rainfall stations were visited and the stations on the Anahola, Kapahi, and Kaneha ditches, the old station on the Lumahai stream, and the station on the Halekua stream were discontinued as having served the purpose for which these were established.

Maui.

Only routine work was done on Maui with the exception of the construction of foot bridges for flood measurements on the Hoolawanui and Hoolawaliilii streams. Twenty-one stream and five rainfall stations were visited, and twenty-two stream measurements were made.

An unusual amount of rain fell during the month, although there were no extreme floods. The lowlands were unusually well supplied. The Wailuku Sugar Co. did not find it necessary to irrigate from March 25 to April 27, a period of 33 days.

MAY PLANS.

Oahu.

A reconnaissance of the Laie and Kahuku streams will be completed and station sites selected.

Kauai.

The Lumahai clock register station will be completed and work started on either the Wainiha, or Waioli, station, the latter including the construction of about three miles of trail.

Maui.

Routine field measurement and rating work will be done.

Very respectfully,

G. K. LARRISON,
Superintendent of Hydrography.

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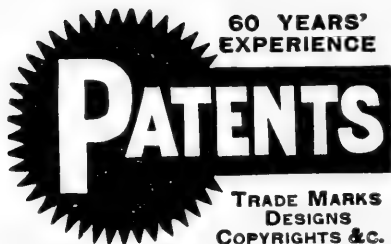
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A complete list of the publications of the Board available for distribution (together with the titles of certain issues now out of print) is to be found on the cover of the last biennial report.

Applications for publications should be addressed to the Managing Director, Box 207, Honolulu, Hawaii.

DIVISION OF HYDROGRAPHY.

Rooms 20-22 Kapiolani Bldg. Tel. No. 3662.

The Division of Hydrography has on hand free publications relative to the water resources of the Hawaiian Islands. These publications furnish detailed data as to daily, monthly, mean, maximum, and minimum run-off of streams and ditches, and also cuts and maps pertaining to the different islands. Much descriptive data relative to the mountain ranges and physical configuration of each island is also contained. These publications will be mailed free of charge on request.

The United States Geological Survey topographic map of Kauai is also on sale, and copies will be mailed on receipt of 50 cents.

The records and maps of this division are available for inspection by any one who desires information relative to water resources, topography, etc. Blue print copies of hydrographic data relative to any stream, ditch, spring, etc., which may be under observation by this division will be mailed free of charge on request.

This division will also make ditch seepage losses and utilization investigations when the actual cost of the labor, meals, subsistence, transportation, etc., of each investigation is borne by those desiring the same.

G. K. LARRISON,
Superintendent of Hydrography.

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DIVISION OF FORESTRY.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications **SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.**

EDW. M. EHRHORN,
Superintendent.

THE HAWAIIAN FORESTER AGRICULTURIST

VOL. XI.

JUNE, 1914.

No. 6

CIRCULAR GIVES FOREST FACTS.

Striking facts regarding our forest resources, their value and their waste, are condensed in an eight-page illustrated circular of the American forestry association just issued. The lumber industry is said to employ 735,000 people, to whom are paid annually \$367,000,000 in wages, the worth of products being \$1,250,000,000. The forests of the country cover 550,000,000 acres.

An average of 70 human lives are sacrificed annually in forest fires, says the circular, and a loss occurs of \$25,000,000. Damage from insects and tree diseases, which follow fire, costs each year \$50,000,000. The cost of destruction resulting from floods is not estimated, but is given as "countless millions."

But the circular expresses hope more than pessimism. As well as the colored pictures showing the forest fire, the effects of the fire, and the damage caused by floods, it shows also forests planted and grown under intensive management, and the national forest ranger scouting for fires on the mountain lookout station. The effective patrol here referred to has reduced "forest fire losses to as low as one-tenth of one cent an acre." It is pointed out that by planting forests an annual income could be derived in the country of \$65,000,000; and by preservative treatment upon timber each year \$100,000,000 could be saved.

TOBACCO CULTURE.

A bulletin is quoted by the *Tropical Agriculturist* (Ceylon) as saying that the best quality of tobacco leaves are produced when the plant grows very rapidly; consequently an abundant and readily available water supply at the right moment is an important factor in the production of high class tobacco. Dry weather in the early stages of plant growth would cause a considerable development of the root system in search of moisture; should this be followed by rains—about a month after planting out—optimum conditions should then obtain for rapid growth.

In the same magazine appears an article on the enzymes of the tobacco plant, which opens with the statement: "Many chemical changes take place in the tobacco plant throughout its growth

as well as during the curing and fermentation periods. New chemical substances are formed and others are decomposed. The final result of these reactions gives the color, texture and aroma to the finished product. A change in these transformations is sufficient to destroy the value of the crop." For the rest, the article goes on to show, partly on the authority of Loew, that the curing process is not due to bacterial agencies, for, "if this were so, it would be possible to produce any desired brand of tobacco simply by inoculation," but that the changes "are due to soluble ferments or enzymes, which are produced in the plant during its development;" Loew having shown the presence of diastase, oxidases, peroxidases, proteolytic enzymes and cellulose-dissolving enzymes. In elaboration of this theory the article says that the enzymes are in the nature of proteins, and are present in the protoplasm of the cells. They are easily destroyed by excessive heat or too rapid drying. In studies of these enzymes in two Kentucky tobaccos, "the seed and leaves showed in every case the presence of appreciable quantities of invertase, diastase, emulsin and reductase, in many cases inulase and a proteolytic enzyme were also found. Soil, on the other hand, contained no enzymes except in two cases. Oxidases appear to be present in the tobacco leaf at all stages of its growth and gradually increase in amount from the seedling stage until the topping stage, after which they gradually decrease until, in the cured leaf, they practically disappear.

"During the curing and fermentation periods there is a great loss in weight, as much as 15 per cent., about $\frac{1}{4}$ of which is solid matter. Certain gases are developed, amongst which ammonia is easily detected. Practically all the starch disappears during the early part of the process and sugar is formed as a new product. This shows the important part played by diastase. The sugars also disappear, being probably destroyed by oxidases. The presence of invertase leads to the conclusion that cane sugar may be stored in the root and afterwards translocated to the leaves. The protein content of the leaves decreases considerably during the ripening of the plant, also during the curing and fermentation period. The presence of amino-compounds during these processes is further proof of proteolytic enzymes. The nitrates also decrease and the nicotine content diminishes. This suggests the presence of reductase and probably there are enzymes acting on the resins and gums. It is believed that the aroma of tobacco is partly due to the decomposition products of gums and resins, as well as to the breaking up of glucosides. Positive tests have been obtained for a glucoside splitting ferment. The presence of fats and proteins results in tobacco of inferior flavor. They are removed by lipolytic and proteolytic enzymes, provided the conditions are favorable.

"The characteristic brown color which develops during fermentation is attributed to the action of oxidases. During the

smoking process it has been shown that an ethereal oil is formed from certain products and this probably contributes to the flavor. Citis, malic and oxalic acids are found in greater quantities in the cured leaf than in the green leaf. These are probably transformed to acetic and butyric acids during fermentation. Thus we see that numerous complex chemical changes take place during the growth, curing and fermentation of tobacco and that enzymes play a very important part in these changes. For the product to obtain the greatest commercial value, extreme care and attention is necessary at the critical stage of maturity and also during the curing and fermentation."

Another plant for paper-making material is presented in this number, the *Hedychium coronarium*, the article describing which is from the *Tropical Agriculturist* of Ceylon. That journal suggests the plant as a possible new product for Ceylon, and it might be well worth experimenting with in Hawaii.

ALFALFA—A PROMISING FORAGE CROP FOR HAWAII.

(Continued.)

EXPERIMENTAL DATA FROM THE COLLEGE OF HAWAII FARM.

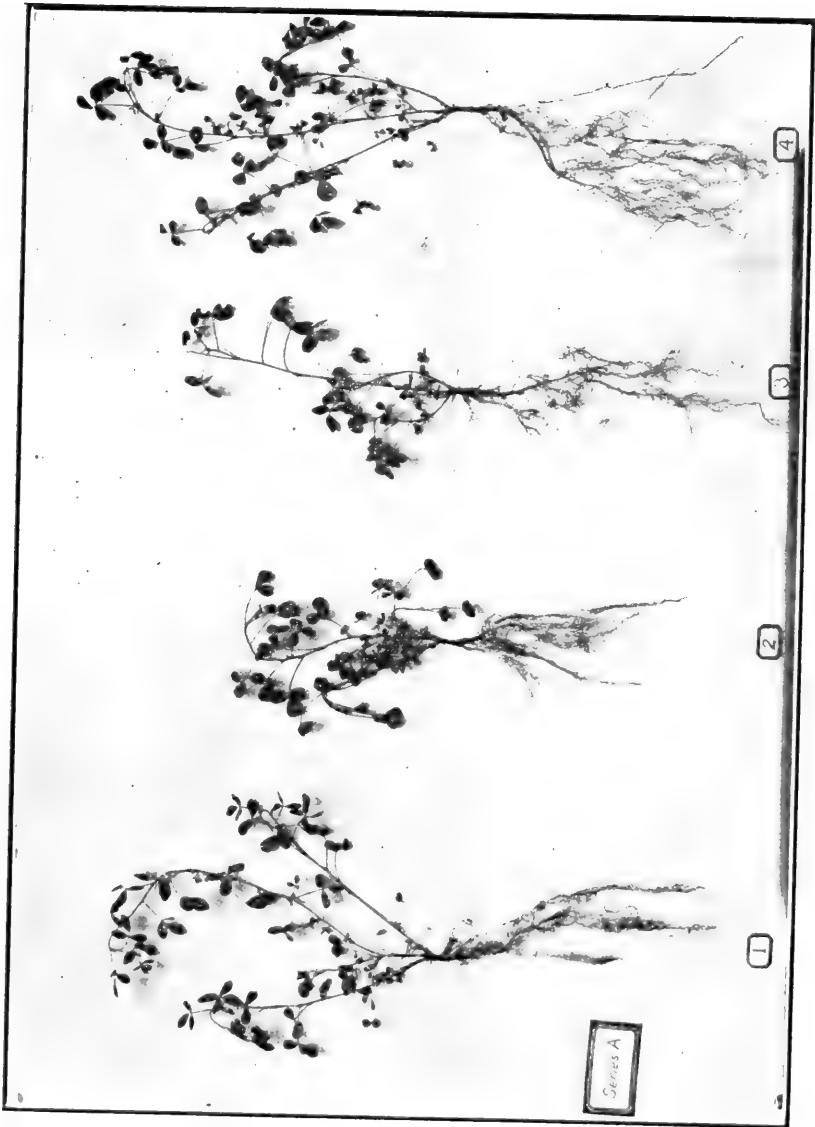
Purcelain is very easily destroyed, but its very rapid growth and continuous reappearance, especially during rainy seasons, makes it a serious pest in young alfalfa.

Worst of all worthless grasses, and the most difficult to eradicate, is the so-called "knot grass." It is rather deep rooted and has numerous underground stems with a number of knots or swellings from which the popular name is derived. These roots are removed from the soil with difficulty, and as each knot is capable of producing many more in a short time, especially when there is an abundance of moisture, it is obvious that the only way to combat it successfully is to keep at it persistently.

Insect Pests. A large number of insects, including several orders and species, are found to be injurious to the growing alfalfa crop, the most serious of which are the cut worms, army worms, alfalfa weevil, alfalfa looper, and various species of grasshoppers.

According to O. E. Essig¹ of California, the alfalfa weevil (*Phytonomus posticus*) has proven to be such a serious pest of

¹ Cal. State Comm. Hort. Monthly Bul. 1 and 2, 1913.



Comparative Study of Alfalfa Seedlings, 100 days from seeding.

alfalfa in Utah, Wyoming and Idaho that neither hay nor seed can be sent into California from these States without first being examined and fumigated by a State official. This weevil feeds on the leaves, and since spraying is dangerous to the animals, no efficient remedy has yet been discovered.

Among the alfalfa insects mentioned by O. E. Essig of California are the following:

Alfalfa weevil (*Phytonomus posticus*),
 Western army worm (*Chorizagrotis agrestis grote*),
 Alfalfa looper (*Autographa gamma californica*),
 Alfalfa crane fly (*Tipula simplex* Drane),
 Grasshopper—various species,
 Western 12 spotted cucumber beetle (*Diabrotica sonor* Lee),
 Clover or almond mite—(*Bryolia pratensis* gar).

According to Farmer's Bulletin No. 495, the clover seed Chalcid fly (*Bruchpaghus funebris* Howard) is also very injurious to alfalfa seed.

Although the cut worm was the only serious pest at the College of Hawaii, it was found to be an extremely serious and difficult one to combat, owing to its presence in large numbers and to its habits. This worm feeds at night, devouring leaves, stalk and all, and hides in burrows a few inches under the ground during the day. This pest, together with weeds, was found to be the cause of a great deal of trouble and disappointment in our efforts to get a stand of alfalfa, for in one night what little growth that was made during a few days would be entirely wiped out.

All possible efforts were made to establish the crop; poisoned bait consisting of 5 lbs. of bran, 5 lbs. middlings, 1 lb. white arsenic, 1 lb. sugar, and about 1 qt. of water, laid out at the rate of 36 lbs. per acre, was found to be fairly effective for several days. Flooding the field was also effective, but in spite of all our efforts, the cut worms continued their work of destruction and promised to maintain the supremacy. In ten feet of row one of the men counted 193 dead cut worms which had been poisoned the night before. The outlook was so disappointing that the men in charge of the field were on the point of giving it up, when it was decided to make a few more trials, which fortunately resulted in perfect success. Since the first crop was harvested there has been no more trouble with either weeds or cut worms, and the crops now being harvested are proving that the time, trouble, and expense devoted to the establishment of the field has been more than worth the effort.

Animal Pests. There are no animal pests of alfalfa in Hawaii, but various sections of the United States have found the woodchuck, ground squirrel, prairie dog, gopher and field mouse rather noxious at various times owing to their habits of burrowing into the ground and eating the roots. Being easily destroyed by drowning, they are not serious pests.

Fungous Diseases. Various fungous diseases have been reported from different regions as being rather serious in alfalfa fields, many of them being especially serious on certain varieties. They generally cause a wilting of the plant with a subsequent dying and rotting. Various fungicides have been used against such diseases with more or less success, but the only recommended method to combat them when they have once become well estab-

lished is to destroy the entire crop by burning and planting the infested and neighboring fields to other crops not subject to the diseases till they have been completely wiped out.

The most common fungous diseases are the various leaf spots, root rots, wilts, and damping off. While some of these are known to exist in Hawaii, and our alfalfa fields show signs of the presence of the leaf spots, they are of no economic importance with the common alfalfa.

Mr. Andrade found that his plantings of Arabian alfalfa at Moiliili, Oahu, were rather seriously infested by a form of root and crown rot.

This same disease is also present at the College of Hawaii farm, where the Arabian, Chilean, Kansas and Australian varieties are doing very well. Only a few plants of the last three varieties are affected, but the Arabian seems to be very much more susceptible to the disease. Very recently the Arabian plants were nearly all wilted by the disease, while those of other varieties close at hand were almost entirely unaffected.

Other Pests and Diseases. Alfalfa on the mainland is also subject to various other minor pests and diseases, including a nematode which causes root rot and a bacterial disease caused by *Pseudomonas medicaginis*. They are not considered to be at all serious.

COMPOSITION AND FEEDING VALUE OF THE CROP.

Alfalfa is a valuable crop for feeding because of its large yield of palatable forage and high per cent. of protein. Following is the average composition of digestible nutrients of alfalfa as compared with that of corn:

Alfalfa.

	Protein	(+ Fat × 2.25) Carbohydrates	Fat	Nutritive Ratio
Green	3.7 %	8.65%	0.6%	1: 2.3
Water free	14.17	54.72	2.3	1: 2.4
Hay	12.3	40.7	1.6	1: 3.3
Meal	17.2	40.0	1.6	1: 2.3

Corn.

Green	1.0	12.5	0.4	1: 2.5
Grain	7.8	66.5	4.3	1: 8.5
Meal	6.4	66.3	3.4	1:10.4

Alfalfa is an excellent food for horses, cattle, sheep, brood cows, and laying hens, especially for milch cows and fattening animals. As it is not a proper ration when fed alone, it should be supple-

mented by other food, such as maize grain, barley, and wheat bran or middlings. The College of Hawaii has obtained very successful results with manienie pasture and the following daily ration:

Wheat bran, 5 lbs.; rolled barley, 3 lbs.

Alfalfa meal, 4 lbs.; green alfalfa, 20 lbs.

Alfalfa does not make good pasture, as it cannot stand heavy trampling and constant close cropping. There is little danger of bloat if the animals are turned on to the field when it is moist with dew, and, besides, the crop is too valuable to be wasted by pasturing.

A very good mixture for the silo or for roughage is one part of alfalfa to two parts of green field-corn or sorghum. This mixture does not only pack better in the silo, but it is also very well liked by the animals, milch cows especially.

ECONOMIC VALUE AS AN AGRICULTURAL CROP.

Alfalfa is the queen of nitrogen-gathering legumes. The plants not only work for nothing for themselves, but will also pay for the privilege.

It is a crop that needs very little attention when once established, which under favorable conditions may be after the first few months, and it lasts a long time. Its requirements are few, and it not only fits very readily into rotation with corn, sorghum and other non-leguminous crops, but also furnishes a large amount of that most costly food material protein. It not only restores the fertility of the land through its nitrogen gathering organisms, but always leaves it in good physical condition and with few weeds. Once established, the field becomes a constant source of food to be had for the cutting and, in dry weather, a little irrigation and tillage, and it excels all other forage crops from the standpoint of yield, feeding value, and cost of production.

Cost of production is the item of greatest importance, regardless of the thing produced. This was one of the main features of the experiment with alfalfa at the College of Hawaii, for no complete Hawaiian reports on this particular phase have as yet come under the writer's notice. The alfalfa growers in and about Honolulu have not taken the trouble to obtain accurate figures regarding either yields per acre or cost of production.

Bulletin 22 of the Nevada Station gives the following as the cost of growing one acre of alfalfa hay in 1909:

Interest and taxes or rent.....	\$ 5.196
Labor of cutting and stacking.....	4.878
Interest and depreciation on machinery.....	.256

Total cost per acre.....\$10.33

Average yield, 3.3 tons. Cost per ton, \$3.10.

Farmers' Bulletin 339 gives the following cost of production for the Eastern States:

Plowing	\$ 2.00
Harrowing	1.00
Fertilizers	10.00
Lime	5.00
Rent	3.50
Seed, 25 lbs. at 18c.....	4.50
Seeding .....	.50
Harvesting 3 tons at \$2.....	6.00
Plowing under alfalfa.....	3.00
	<hr/>
Total cost	\$35.50
	<hr/>
Three tons alfalfa at \$15.....	\$45.00
Cost to be deducted.....	35.50
	<hr/>
Profit	\$ 9.50
	<hr/>

The experiments at the College of Hawaii were begun last August, and the yearly cost and yields cannot be accurately calculated at present, but \$175 may be considered as a fairly good estimate of the annual cost per acre. This is rather high because of the necessary accuracy of weighing, etc., during the experiments, and the small plots which do not permit of the use of machinery to any extent. While the cost to establish the crop is high, the crop is lasting and subsequent harvests and cultivation cost but very little. At our last harvest, the total cost of cutting, weighing and cultivating a single crop was \$19.92 per acre, or \$2.25 per ton of green fodder obtained, not a bad investment with the market price of the product at \$5 per ton.

1. *Varieties Under Test.* Utah, Kansas and Australian strains of the common alfalfa and the Arabian variety were seeded August 20-22, 1912, in $\frac{1}{8}$ -acre plots at the rate of 15 lbs. per acre. The seed was drilled in rows 12 inches apart and 200 feet long. A light rainfall during the night of August 21 left the soil in good condition, with the result of good strong germination in all four plots.

2. *Troubles Begin.* Germination of the alfalfa seed was accompanied by that of a greater number of weeds, which kept what little labor there was to be had constantly busy at weeding. Before the plants had become more than a few inches high, the attack of cut worms described above made things still more discouraging, not only by their destructiveness, but also by their persistence.

3. *Combating the Worms.* Our troubles with weeds were considered rather serious, but the presence of the cut worms made them even greater. The laying of bait as described above under "Insect Pests" was at first found to be rather disappointing in its results; in fact, the outlook for success was so far from favorable that failure was already contemplated. However, the strong "never-say-die" spirit of Prof. Krauss, our agronomist, though beginning to totter, could not quite be shaken down. He faced the enemy with grim determination and finally won out after a long, hard fight.

The effectiveness of the bait lasted for several days in spite of light nightly rains. The Paris green mixture was a little better than the white arsenic, but from the standpoint of cost the latter was found to be preferable to the former.

As already mentioned, irrigation was found to be very helpful in drowning out the worms, and it seems that the most effective method of fighting these worms would be to till the soil lightly to loosen it up, irrigate thoroughly and heavily for a few hours and then lay out poisoned bait for those which escaped drowning. Since cut worms are active only at night, it is best to spread the bait as late in the afternoon as possible.

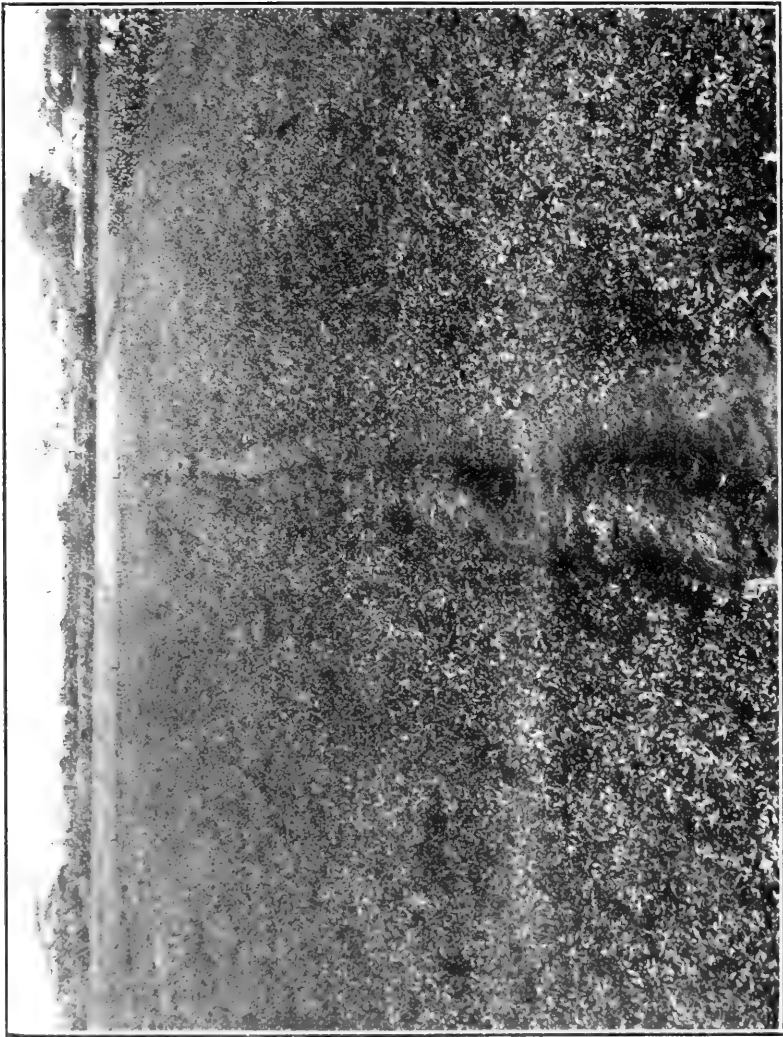
4. *Replanting.* The work of the cut worms was so destructive that it was found necessary to replant large portions here and there in order to obtain a good uniform stand. All plots were badly infested with cut worms, but it seems that the Arabian variety was the most susceptible.

5. *Growth of the Plants.* After the cut worms were held in check the plants grew very well. The first crop was harvested in the middle of October—seven weeks after planting. The plants were not quite mature and very small yields were, of course, obtained, but the prevalence of weeds and cut worms made it necessary to harvest early.

All four varieties have grown very well, but the Arabian variety has not blossomed and seeded well. The other three varieties proved very vigorous and produced an abundance of fodder and also a good deal of seed.

One plant of the Utah strain untouched by the sickle produced in seven months 308 vigorous stems by actual count and yielded large quantities of seed, which proved to be of good vitality. The College plans to do some breeding work with the progeny of this plant, which weighed more than five pounds on harvesting at the end of eight months. The stems were a little over four feet high, the average height of the whole Utah bed at maturity being three and one-half feet. The Arabian variety averaged but thirty inches.

That the cut worms are not troublesome after the plants have become well established is shown by another experiment conducted from January 11, 1913, to the middle of February. At



Young Alfalfa at College Farm, 1913.

this time two beds of the Utah and Kansas seed were planted broadcast in plots opposite those still under consideration, and separated only by a ten-foot roadway.

Germination was excellent, but the prevalence of weeds and cut worms, together with a shortage of labor, resulted in failure. The important point to be noted, however, is that while the cut worms were very destructive on the young seedlings, they did not harm the older plants.

6. *Irrigation and Fertilization.* All four plots received three irrigations of two hours each in September (September 1, 15 and

26) during the fight against the cut worms. On October 17 the Utah variety received an hour's irrigation in order to drown out cut worms. No further irrigation was made until March 3-6, when each plot was given a final irrigation of from two to three hours' duration.

At this time the Kansas and Arabian varieties were fertilized with nitrate of soda at 750 and 800 pounds per acre respectively. Since all four plots showed equal improvement, it was concluded that while the irrigation was beneficial, the addition of nitrate had little or no effect on the resulting crops.

7. *Harvesting.* Once established, the crops were ready for harvesting every thirty days for the common variety, and every third week for the Arabian.

All harvesting has been made with the ordinary hand grass sickle. This method should not be used on large fields, for the machine mower will do the work much more cheaply and rapidly. Therefore, in considering the figures on the "cost of harvesting" to follow later, the reader should not forget that the small size of the experimental plots and the hand cutting have made this item higher than it need be.

8. *Yields.* From the first to the last cutting the yields have been constantly increasing. While they were rather light at first, the last cuttings made so far were as follows:

Utah; May 19, 1913—2310 lbs. green or 9.2 tons per acre green.

Kansas; May 22, 1913—2076 lbs. green or 8.2 tons per acre green.

Australian; April 28-May 14—2096 lbs. green or 8.4 tons per acre green.

Arabian; April 28-May 14—1036 lbs. green or 4.2 tons per acre green.

Average, 7.5 tons per acre green.

These yields might have been even better if the crops had been taken at the proper time. The small herd of the College could not use more than about one-sixty-fourth of an acre of fodder per day, and the crops were therefore left standing till ready for use. Hence every bed was not cut absolutely uniformly, though an effort was made to harvest the crops as uniformly as possible.

(To be continued.)

SALT AS A MANURE.

In Söderbaums' experiments at Stockholm it was found that the application of common salt to oats caused a considerable increase in the yield of those cases in which nitrogen was given as nitrate of soda or sulphate of ammonia, but not in the form of ammonia

chloride. No injury due to manuring with common salt was observed. The results seem to justify the conclusion that where potash and phosphoric acid are present in sufficient quantity, and the water requirements of the plant are met, the increase yield by the addition of salt is to be traced to direct manurial effect, especially in respect of the chlorine part of it.—*Internat. Inst. of Agric.*

STORING AND MARKETING SWEET POTATOES.

(From Farmers' Bulletin 548, U. S. Department of Agriculture.)

Each year the sweet potato is becoming of greater importance as a money crop in the South. The value of this crop in the United States in 1909 was \$34,429,000, 90 per cent. of which was produced in the Southern States. The total area devoted to sweet potatoes in the United States increased from 537,000 acres in 1899 to 641,000 in 1909, and the yield increased from 42,500,000 to 52,200,000 bushels. The total value of the crop increased at a much more rapid rate than either the acreage or yield, showing an increase of 78.3 per cent. in 10 years.

With better methods of storing and marketing the potatoes, their value could be doubled without increasing the acreage or production. This is especially true in the South, where the potatoes are either rushed on the market at digging time, when the price is low, or stored in outdoor pits or banks, where a large portion decay. Very few of the sweet potatoes stored in pits or banks ever reach the market, for from 25 to 50 per cent. spoil and those that remain are not of good quality. Even if the pit or bank method of storage would keep the potatoes it is not economical. Too much labor and expense are required to make these banks every year and to get the potatoes out when wanted for market. Sweet potatoes can be marketed more economically and to much better advantage from storage houses. It is not advisable to open a bank when the soil is wet or the weather cold, as these conditions injure the potatoes and cause them to decay. Outdoor pits and banks can not be depended on. Some years a very small number of the potatoes spoil in banks, while in other years practically the whole crop is lost. The only safe and practicable method of storing sweet potatoes is in a storage house, as the potatoes can be taken out at any time without subjecting them to unfavorable conditions.

To keep sweet potatoes in good condition they must be (1) well matured before digging, (2) carefully handled, (3) well dried or cured after being put in the house, and (4) kept at a uniform temperature after they are cured.

The grower can judge when his sweet potatoes are ripe by breaking or cutting the tubers and leaving them exposed to the

air for a few minutes. If the cut or broken surface dries they are mature, but if the surface remains moist they are not ready to be dug.

The second essential, careful handling, is of the greatest importance and should be practiced in digging, gathering, hauling, and unloading. The potatoes should be sorted in the field and gathered in padded baskets or boxes to prevent bruising or breaking the skin. The baskets or boxes should be loaded on the wagon, hauled to the storage house, and the potatoes carefully poured into the bins. When they are to be hauled very far a wagon with bolster springs should be used. Sweet potatoes should never be thrown from one row to another, loaded loosely into a wagon body, or hauled in bags, because any of these methods will bruise them and give a chance for disease to enter.

Careful handling is one of the essentials in keeping sweet potatoes, and there is no more important place to practice it than in the field at digging time. The implement used to dig sweet potatoes should be one that does not cut or bruise the roots. One of the best types of diggers is a plow with rolling colters on the beam to cut the vines and with rods attached to the moldboard to free the roots from the soil and vines. After the potatoes are dug they should be scratched out by hand and allowed to remain exposed long enough to dry off. The digging should be done, if possible, when the weather is bright and the soil is dry.

The potatoes should be graded in the field in order to reduce the cost of handling to a minimum. A good plan is to go over the rows and pick up the sound, marketable potatoes in one basket, then gather all of the seed stock in another basket or box, and the injured ones in still another. These lots should be stored in different bins. By following this method it will not be necessary to grade the potatoes at the storage house and will thus save time and reduce the cost of handling. The potatoes should be poured into the bins as carefully as possible, to prevent bruising. Sweet potatoes can be stored in boxes, hampers, baskets, or bins with equally satisfactory results. The preference of the individual grower will determine the method to be employed. Each year after the sweet potatoes have been marketed the house should be thoroughly cleaned and disinfected before being used again. All dirt and refuse should be cleaned out and all parts of the interior sprayed or washed thoroughly with a solution of formalin (1 pint of formalin to 10 or 15 gallons of water). Diseased roots should not be thrown on the manure pile or on land to be used for sweet potatoes, the safest plan being to burn them.

In filling the storage house the workmen should begin at the back end of the bins and pour a layer of potatoes about 2 feet deep in all of the bins rather than fill one bin at a time. If the bins are 8 or 10 feet long it is a good plan to divide them into

two parts. By nailing cleats to the middle support of the bins, the partition can be raised as the bins are filled. The partition boards should have some space between them to allow free circulation of air. A 1-inch block between the boards will be satisfactory to separate them. By dividing the bins in this way the back of the bin can be filled without walking over the potatoes in the front part. When taking the potatoes out, those in one section of a bin can be removed without disturbing the remainder. This is very important where the potatoes are sold in small quantities.

One reason why southern farmers have not received good prices for their sweet potatoes is that they have not used proper methods of handling and marketing. In many cases the potatoes are badly bruised and cut in digging, are put in bags or rough barrels without grading, and are rushed on the market when there is an oversupply. The secrets of success in getting high prices are (1) to carefully grade, clean, and pack the product and (2) to put it upon the market when there is a good demand.

When the potatoes are to be marketed they must be carefully graded, no matter how well it had been done when they were put in the house. The market demands a medium-sized, uniform type of sweet potato, free from bruises or decayed spots. In grading, the large, overgrown, and the crooked, broken, or bruised roots should be kept at home for feeding or for canning. The best potatoes will bring a higher price when separated from the culls. Two market grades are sometimes made—the “extra selects” or “primes” and the “seconds” or “pie stock”—but the southern farmer will do well to make just one market grade and keep the others for feeding to his live stock.

After carefully grading the potatoes they should be put in clean, neat, attractive packages. Bags should never be used, as the potatoes become badly bruised when handled in this way. The standard veneer potato barrel with a burlap cover is usually used in summer or autumn, but for winter shipment the double-headed stave barrel or tight box is used. The smaller type of package, such as the bushel hamper, bushel box, or basket, is becoming more popular each year. A neat and attractive package of well-graded potatoes will bring a good price almost any time, even when the market is overstocked with inferior goods.

The value of the sweet potato has increased about 80 per cent. in the last 10 years. With better methods of storing and marketing the present value could be doubled.

Sweet potatoes can be kept satisfactorily in a storage house where the temperature and moisture conditions can be controlled.

Sweet potatoes to keep well must be well matured, carefully handled, thoroughly cured, and kept at a uniform temperature while in storage.

Thorough ventilation is essential during the curing period.

The temperature should be kept at about 80° or 85° F. during the curing period and reduced gradually to 55° after the potatoes are cured.

Fluctuations of temperature should be avoided throughout the storage period.

The varieties of sweet potatoes that the markets demand should be grown.

The potatoes should be carefully graded, cleaned, and packed in neat and attractive packages.

Sweet potatoes should never be marketed in bags or in bulk.

Veneer barrels or bushel hampers are desirable packages to use during mild weather and double-headed stave barrels or tight boxes in cold weather.

HEDYCHIUM.

(From the *Tropical Agriculturist*.)

Peradeniya, May 15, 1913.

At the tenth ordinary meeting of the Royal Society of Arts held in London on February 12th last a paper on "New Sources of Supply for the Manufacture of Paper," by Messrs. Clayton Beadle and Henry P. Stevens, was read. Wood pulp is the raw material from which paper is chiefly made but it is now being realized that the world's supply of wood pulp is showing signs of exhaustion and that prices are rising. It is stated that the cost of production of ground wood pulp has advanced 50 per cent. in the United States during the last 10 years.

The paper trade has been turning its attention to other sources of supply of raw material and one of the plants to which attention is drawn is *Hedychium coronarium*.

This plant is of the same natural order as ginger and cardamom, and grows profusely in Brazil as shown in the frontispiece taken from the Kew Bulletin.

It is propagated by root-stocks from which a crop in one year might be expected; from seed, two years would probably be required. It grows in damp localities near water courses at elevations ranging, in Ceylon, from sea level to 4,500 feet. In Brazil it has taken possession of land cleared for sugar which suggests that land suitable for the growth of sugar-cane would be suitable also for *Hedychium*. In that country it grows in a thick jungle to a height of from 3 to 6 feet; as many as 100 to 150 stems being counted in a square yard. After cutting down, a period of from 4 to 5 months elapses before a second crop is ready, the rainfall being about 60 inches per annum.

Root-stocks are continually reproduced so that continual cropping year by year would seem to be ensured.

YIELDS.

It is estimated that well-covered land with stems say 4 inches apart would yield 7 tons of raw dried fibre equal to 4 tons of paper per acre per annum.

In the neighborhood of Morretes in Brazil tracts of land of from 7,000 to 8,000 acres are covered with *Hedychium* capable, it is believed, of yielding at least 50,000 tons of dry fibre sufficient for the production of 30,000 tons of paper per annum. Another estimate gives 6-10 tons of dry raw material per acre per annum equal to 4 tons of pulp compared with 2 tons and 0.70 tons respectively of rice straw, 0.20 tons of pulp wood once in 40 years, and 1.35 to 1.57 tons of pulp from bamboo once in 5 years. *Hedychium coronarium* gives a greater weight of raw material per acre than any other product listed.

DISPOSAL OF RAW MATERIAL.

There are three methods of dealing with the raw material, the simplest being the drying and crushing between rollers of the stems after which they may be sent to Europe. This entails the payment of freight on a large proportion of unserviceable material.

Another method is to pulp the stems as is done with wood; a third method is to manufacture paper from the green stems on the spot. It is stated that the whole treatment from harvesting to the manufacture of paper need not occupy more than twenty-four hours.

No figures are available to show the cost of production of a ton of pulp or of the returns. Messrs. Clayton Beadle and Stevens obtained 4 per cent. and over of dressed fibre from *Hedychium* compared with $1\frac{1}{2}$ per cent. from Manila hemp, the papers produced possessing a greater tensile strength than those of the strongest Manila papers. Owing to the semi-gelatinous nature of the cells a natural parchment can be made.

ITS VALUE FOR CEYLON.

As has been stated *Hedychium coronarium* occurs in Ceylon over a considerable range of elevation. In Brazil it takes possession of the land to the exclusion of all other vegetation but whether it would behave like that in Ceylon has not been ascertained. Its value will depend upon its power of spreading and reproducing stems. If it is found to flourish under irrigation it may prove a valuable product for our dry zone. There would

appear to be ground for thinking that it may prove suitable for cultivation under the tanks.

A closely allied species, *H. flavescens*, is more widely distributed in Ceylon than *H. coronarium*, but its value as a source of paper has not yet been ascertained. Some dried stems are to be sent home for trial and also root-stocks from which green stems may be obtained on the spot for manufacture.

R. N. L.

*PLANTING SWEET POTATOES FROM SPROUTED
TUBERS AND VINES.*

The curator of the Botanic Station, Montserrat, has sent in the results of an experiment carried out to test the value of sweet potato cuttings taken from sprouted tubers as compared with cuttings taken from the vines in the ordinary way. It may be mentioned that similar experiments were conducted in Cuba some few years ago and reported on in the *Agricultural News*, Vol. VII, p. 120, where it will be found that the plots planted with slips returned a crop three and a half times as great as those planted with cuttings. In this experiment the gain of 350 per cent. fully repaid the extra expense and trouble involved.

In the recent Montserrat trials there has been no such phenomenal difference noticed, though the figures show there was, in the case of some varieties, quite a considerable increase in yield from the tuber cuttings compared with the vine cuttings. It is interesting to observe that no difference in vigor was noticed in the rows planted with the two kinds of material.

The following are a few of the yields which seem to be the most striking: Red Bourbon (ordinary vines) 114 lbs., (tuber cuttings) 145 lbs.; White Gilkes (ordinary vines) 83 lbs., (tuber cuttings) 111 lbs. In no case did the tuber cuttings give a lower yield than the ordinary vines, but it is not established that the average increase is sufficiently large to warrant the systematic planting of tuber cuttings instead of ordinary vines. At the same time, the matter is worth serious consideration in the case of one or two special varieties.

It should be stated that as regards the size of the plots utilized in the experiments, the length of the row was 81 feet, the rows were 4 feet apart and the plants 2 feet. Each plot was therefore approximately 1/134 acre in area.—*Agricultural News*.

FERTILITY OF SOILS.

We have for long been forming the opinion which we now feel definite about, that it is not lack of fertility that is wrong with any soil here that will not grow good crops. A really poor soil is rare in Jamaica. The fertility is not gone, but the humus often is. The negative results in the majority of the experiments in bananas, cane and cocoa—which are the crops which have been most systematically experimented upon—in the use of fertilizers have helped us in coming to this conclusion.

In Dominica the application of a mulch on cocoa proved more profitable than the use of fertilizers, and as that is a country of heavy rainfall, it was not because the mulch conserved moisture, but because of the addition of so much humus. In Trinidad the experiments with fertilizers on cocoa have been mostly negative. Here the Department of Agriculture has had negative results with fertilizers on sugar canes and bananas, generally speaking. Yet the application of fertilizers on a leguminous crop shows visibly good results in the increased growth of the peas or beans grown as green dressings, compared with non-fertilized crops—and through the fertilized green dressings the bananas and cane benefit from the addition of a greater amount of humus containing stores of nitrogen, potash, phosphoric acid and lime.

Lands that would not grow bananas at all, now, simply through a thorough system of trenching, are growing magnificent fruit, yielding 80 per cent. bunches. Rich bottom lands that were beginning to give poorer and poorer results and yet are trenched, at once responded to a good application of lime.

All that is wanted, in addition of course to tillage, to make lands renew their youth, are (1) drainage, (2) humus, (3) lime.

The humus can be got by growing heavy crops of cowpeas, Jerusalem peas or overlook beans or Bengal beans, and the heavy crops of these can be secured by tillage aided by fertilizers, and as these legumes do not require nitrogen, they are economical. Nitrogen is the most expensive element in fertilizers.

Tillage, drainage, humus, lime, applied with knowledge and experience of different crop requirements will enable fine crops of any product to be raised.—*Jamaica Agric. Soc. Journal.*

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The Division of Hydrography has on hand free publications relative to the water resources of the Hawaiian Islands. These publications furnish detailed data as to daily, monthly, mean, maximum, and minimum run-off of streams and ditches, and also cuts and maps pertaining to the different islands. Much descriptive data relative to the mountain ranges and physical configuration of each island are also contained. These publications will be mailed free of charge on request.

The United States Geological Survey topographic map of Kauai is also on sale, and copies will be mailed on receipt of 50 cents.

The records and maps of this division are available for inspection by any one who desires information relative to water resources, topography, etc. Blue print copies of hydrographic data relative to any stream, ditch, spring, etc., which may be under observation by this division will be mailed free of charge on request.

This division will also make ditch seepage losses and utilization investigations when the actual cost of the labor, materials, subsistence, transportation, etc., of such investigations is paid by those benefited.

G. K. LARRISON,
Superintendent of Hydrography.

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JULY, 1914

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DIVISION OF FORESTRY.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications
SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207,
HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent.

THE HAWAIIAN FORESTER AGRICULTURIST

VOL. XI.

JULY, 1914.

No. 7

This number contains the conclusion of the article on "Kalo," by Professor MacCaughey and Mr. Joseph S. Emerson, which was begun some months ago. It is probably the most exhaustive treatise on what has been called "the Hawaiian staff of life" which has ever been written.

FORESTER HOSMER'S DEPARTURE.

In the departure of Mr. Ralph S. Hosmer, for the past eleven years superintendent of forestry for this Territory, to take the headship of the school of forestry of Cornell University, Hawaii loses one of the most useful public officials that have ever been in its service. Having graduated from Harvard in 1894 with the degree of agricultural science, Mr. Hosmer was two years later appointed assistant in the division of soils in the United States department of agriculture. In 1902 he received the degree of master of forestry from the Yale forest school, and in 1903, upon the recommendation of Mr. Gifford Pinchot, was appointed superintendent of forestry for the Territory of Hawaii. Prior to his arrival here very little government forestry had been attempted, although the way had been pioneered to considerable extent by some forest planting in the environs of Honolulu, also by a good deal of foresting done by far-sighted sugar planters. For many years also the press had urged the importance of systematic forestation of the bald expanses on mountain and plain, and a standing committee of the Sugar Factors' Association issued annual reports on the subject charged with valuable information and inspiration.

Yet it was left to Mr. Hosmer to place the cause of public forestry upon a scientific footing, and how well he has acquitted himself of the task the records of the Board of Agriculture and Forestry attest. "At the end of the year 1913," Mr. Hosmer's latest annual report is quoted, "there were 34 forest reserves in Hawaii with a total area of 786,869 acres, of which 60 per cent (540,877 acres) was land belonging to the Territory." This is Mr. Hosmer's achievement in gross, but it falls very far short of being an inventory of his services to Hawaii. His introduction of useful trees, plants and seeds, by purchase and exchange; his personal interest in town improvement schemes, his advice always cheer-

fully given to citizens in the beautifying of their home plots, his enlistment of children's interest in forestry through Arbor Day exercises, are items of his enthusiastic devotion to duty which will add to community regret over his departure. Besides his superintendency of forestry he was chairman of the Territorial conservation commission and a regent of the College of Hawaii.

Socially, Mr. Hosmer will be greatly missed, as, besides his venerable mother and himself having during his stay been members of select circles, last January he brought a winsome bride here from Massachusetts, making Honolulu society rejoice in the feeling that now his home was established here. Cultivated and courteous, Mr. Hosmer has been highly esteemed personally, throughout his residence in Hawaii, by all with whom he has come in contact.

"Invest in the Tropics" is the title of a handsome paper-covered book issued by the publishers of The Tropical Mail, a new periodical fathered by the Tropical Agriculture Development Agency, Ltd., with the address, 17, Waterloo Place, London, S.W., England. The book is finely illustrated and filled with snappy articles on many tropical products, while the periodical is packed with similar matter but not illustrated.

An enterprise of the Massachusetts Forestry Association, which might well be imitated here, is that of conducting town forestry contests with prizes for tree-planting on streets.

Reports of the various divisions of the Board of Agriculture and Forestry for last month will repay perusal. They show effective work all round.

DIVISION OF ANIMAL INDUSTRY.

Honolulu, May 31, 1914.

Dr. V. A. Norgaard, Chief of Division of Animal Industry.

Sir:—I have the honor to report the following work accomplished during the month of May, 1914:

TUBERCULOSIS CONTROL.

The dairy stock of the following ranches and dairies were submitted to the intradermal tuberculin test under the new and improved method, viz., using the fold in the skin beneath the margin of the lower eyelid instead of the subcaudal fold:

	T.	P.	C.
Waialae Dairy	454	423	11
Pond's Dairy	418	417	1
J. Gouveira	13	12	1
M. Brazon	4	4	0
Nishimoto	8	8	0
M. Pacheco	7	7	0
M. Andrea	12	12	0
O. R. & L. Co. Ranch.....	683	674	9
J. M. Guerriero	10	10	0
J. Ferriera	1	1	0

From the above tabulated list it will be seen that during the past month 1590 head of dairy cattle have been tested with the result that 1568 were passed and tagged, and 22 head condemned and branded, giving a percentage of disease of 1.3%. Of the animals condemned on the Railroad ranch, one was an imported shorthorn bull which had been kept at Bellina's dairy for three weeks or a month and without doubt picked up the infection there; three were heifers born and raised on the place and in which the disease was in its earliest stages, and five were cows all of which had been in Bellina's dairy at some time or other and had carried the infection from there to Honouliuli.

POST-MORTEM EXAMINATIONS.

Opportunity was given to make several post-mortem examinations on cattle which had recently been condemned, the results of which were as follows:

No. 1. Jersey heifer, 3 years old, in prime condition, dressing about 300 lbs. The reaction at the point of injection was the smallest which has been observed under the new method, but was unmistakable in character. Lesions: Right retro-pharyngeal lymph gland enlarged to four times its normal size and rather flabby. On section the surface showed the effects of a productive inflammation, there being a great increase in the interstitial connective tissue, which was gradually drawing the parenchymatous tissue into lobules. There were, however, no macroscopic tuberculous lesions. The left lung showed numerous tuberculous nodules the size of a dime in both its cervical and diaphragmatic lobes. There was a large abscess in the liver.

No. 2. Grade Durham heifer; 2½ years old and in prime condition, dressing 347 lbs. Reaction of good size and well defined. Lesions: A very careful post-mortem examination revealed one of the mesenteric glands affected. The gland was enlarged to three times its natural size and filled with a gritty mass of tuberculous material; the only lesion of macroscopic size in the body; still the reaction was large, showing the hypersensitive condition of the tissues.

No. 3. Grade Jersey cow, six or seven years old, and in poor condition. Reaction medium in size. Lesions: The mediastinal lymph glands contained nodular masses of tuberculous material. The diaphragmatic lobes of both lungs contained large masses of inspissated tuberculous material with cavities opening directly into the bronchial tubes.

No. 4. Holstein heifer, two years old and in prime condition; reaction medium size. Lesions: The only lesion which could be found after a careful post-mortem examination was in the left retro-pharyngeal lymph gland, which was greatly enlarged and filled with small nodules about a quarter inch in diameter.

No. 5. Pure-bred Jersey bull in fine condition and dressing 687 lbs. Reaction very large, a swelling the size of an orange appearing at the point of injection. Lesions: The disease was in its earliest stage, there being few lesions. The retro-pharyngeal and mediastinal glands contained a few small nodules.

No. 6. Pure-bred Jersey bull in fine condition and dressing about 700 lbs. Reaction very large, though slightly smaller than in the previous bull. Lesions: The lesions were confined to the retro-pharyngeal glands and consisted of five or six nodules all about the same size, viz., three mm. in diameter. Lesions were not observed in any other part of the body, thus showing the infection to be of very recent origin.

In the above six cases practically all grades of reactions were observed, from the smallest to the largest, and with these reactions the corresponding stages of the disease as disclosed by the lesions on post-mortem examination, with the one exception of the generalized case, and a reaction in such a case would be of the small type.

A study of the different types of reactions to the intradermal test in connection with the amount of disease found on post-mortem examination has established a certain definite relation between the size of the swelling at the point of inoculation and the amount of disease present in the animal system, so that it may be laid down as a rule that the more recent the infection and consequently the fewer and smaller the number of lesions the larger will be the reaction.

Reactions of this method of testing, depending as they do on the anaphylactic condition of the tissues, will vary as this hyper-sensitive condition varies, and naturally the highest state of anaphylaxis will obtain when the tissues of the body are making their first fight against the invading organisms and the death-dealing toxins first begin to circulate in the blood stream.

When the disease has become established in the body and has formed larger or small localized lesions or has become generalized, the tissues, through habit and the long-continued presence of toxins circulating through them, gradually lose their highly-sensitized condition and so respond less to the injection of tuberculin.

But at no time after an animal has once become infected with tuberculosis do the tissues lose entirely their sensitiveness and thus show an immunity to the injection of tuberculin. Through their fight against the invasion of the disease they have become permanently altered; they are no longer the normal tissues they were before, but continue to show increased or decreased susceptibility to the injection of small doses of tuberculin.

IMPORTATION OF LIVE STOCK.

May 4—Sierra, San Francisco: 9 crates poultry.

May 5—Lurline, San Francisco: 18 crates poultry; 2 crates rabbits, 1 crate white mice, U. S. L. Ex. Station.

May 7—Hyades, Seattle: 4 crates poultry.

May 12—Wilhelmina, San Francisco: 16 crates poultry; 1 dog, E. Kilbourne.

May 15—Hongkong Maru, Orient: 2 crates black Minorcas, K. Machido.

May 18—Sonoma, San Francisco: 21 crates poultry.

May 19—Manoa, San Francisco: 1 horse, A. Schnerr; 6 hogs, J. W. Manning, Kahului; 1 crate chickens, H. C. & S. Co., Kahului; 40 crates poultry.

May 25—Hilonian, Seattle: 11 mules, Schuman Carriage Company.

May 26—Matsonia, San Francisco: 24 crates poultry; 1 dog, W. F. X. Company.

Respectfully,

L. N. CASE,

Assistant Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

Honolulu, May 31, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the work performed by the Division of Entomology for the month of May, 1914, as follows:

During the month 37 vessels arrived at the port of Honolulu, of which 25 carried vegetable matter and one vessel molding sand.

Disposal.	Lots.	Parcels.
Passed as free from pests.....	840	14,188
Fumigated	4	64
Burned	22	23
Returned	1	1
Total inspected	867	14,276

Of these shipments, 13,991 packages arrived as freight, 152 packages as baggage of passengers and immigrants, and 133 packages by the U. S. mail.

RICE AND BEAN SHIPMENTS.

During the month 10,567 bags of rice and 1098 bags of beans arrived from Japan and after thorough inspection were allowed to land, being free from any pests.

PESTS INTERCEPTED.

Twelve packages of fruit and two packages of vegetables were found in the baggage of passengers and immigrants from foreign countries, all of which, being contraband, was burned.

A shipment of ornamental plants from Ohio was taken from the postoffice. It was infested with red spider, and after fumigation was allowed to be delivered. A package of rose plants was also treated on account of being infested with rose aphid. Three hundred fifty-one cases of apples were overhauled for spun-up worms in the boxes before they were permitted to land. Nine bags of coconuts arrived from Fanning Island and were treated with carbon bisulphide fumes before delivery. This is done more as a precautionary measure, because we often find species of beetles and other insects hibernating in the shipment. A few coconuts in this lot had a common scale insect (*Hemichionaspis minor*) on the stem ends; we also found a cricket.

BENEFICIAL INSECTS.

Six small packages arrived from Dr. Silvestri from Italy, containing *Staphylinid* beetles, enemies of hornfly, housefly, stablefly and other dung flies. As all these are shipped with manure I have been very cautious to take out all living beetles and then fumigate and destroy by burning all material left. Four of the packages contained 68 living beetles in good condition; in the two other packages all the beetles were dead on arrival.

Two lots of inoculated Japanese beetles were sent to Molokai, two lots were sent to Kauai and four lots were distributed on Oahu.

HILO INSPECTION.

Brother Newell at Hilo reports the arrival of nine steamers and one sailing vessel, of which six steamers brought vegetable matter consisting of 147 lots and 2259 packages which were found all free from pests and were allowed to land. There also arrived direct from Japan the steamer Seiyo Maru, bringing 6500 bags of

rice, 341 bags of beans, two bags of sesame seeds and two bags vegetable seeds; the last were fumigated as a precautionary measure, and the rice and beans were found free from weevil and rice moth.

While on the subject of Hilo inspection I beg to report that I have had two large tarpaulins made which could be used for fumigating purposes, should any rice or bean shipments arriving at Hilo be found infested with either pest. This matter was agreed to by the president of the board.

INTER-ISLAND INSPECTION.

During the month of May 58 steamers plying between the islands were attended to and the following shipments were inspected and passed:

Plants	53	packages
Taro	507	"
Fruit	42	"
Vegetables	5	"
<hr/>		
Total passed	607	"

The following packages were refused shipment on account of being either infested with pests or having objectionable soil attached to plants:

Plants	17	packages
Fruit	3	"
<hr/>		
Total refused	20	"

Much of my time has been given to the distribution of parasites of the Mediterranean fruit fly in conjunction with Mr. Bridwell's work. The successful breeding of *Opus humilis* from many of the smaller fruits gives encouragement for the establishment of this parasite in the islands. We are sending out many strong colonies to all the islands, and we are keeping up the breeding of all parasites which Dr. Silvestri brought, as well as the two species Mr. Fullaway brought from Manila, and are making a special endeavor to breed and distribute the *Opus humilis* as much as possible during the present fruit season.

Respectfully submitted,

E. M. EHRHORN,
Superintendent of Entomology.

DIVISION OF FORESTRY.

Honolulu, May 31, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I have the honor to submit as follows the routine report of the Division of Forestry for the month of May, 1914:

FOREST FENCING.

Progress is being made on the several fencing jobs now under way on forest reserve boundaries, under contracts or agreements with the board, at Wailua, Kauai; Nahiku, Maui, and Kohala, Hawaii. At other places on Hawaii and Maui forest fencing required under government leases is also going forward. In the Kona district, Hawaii, an extensive project of rebuilding the forest fences on the boundaries of the private forest reserves of the Bishop Estate is pretty nearly completed. There are still a good many places that need attention both on government and privately-owned lands, but the end of this calendar year will see the forest reserves, public and private, throughout the Territory better protected than at any time previous.

During the middle of the month, May 12-18, I made a week's trip to Kona to arrange for the fencing of the Waiaha Spring forest reserve in North Kona, and to inspect the fence about the Honuaula forest reserve in the same district, which has recently been put in repair by the lessees of the adjoining government lands, Messrs. F. R. Greenwell and J. A. Maguire.

TREE PLANTING.

I was glad while in Kona to find a newly-awakened interest in tree-planting among several of the large landowners. On the lands of the Greenwell estate considerable tree-planting is contemplated in the near future. On the Captain Cook Coffee Company holdings a very promising plantation of Sugi (*Cryptomeria japonica*) has recently been established, and at Huehue, Mr. J. A. Maguire's ranch house, a plot of a number of species of eucalyptus is doing well. In the vicinity of Huehue the silk oak (*Grevillea robusta*) has become well established and is reproducing itself vigorously from self-sown seedlings.

Tree-planting in Kona is of particular importance because of the rapid deterioration of the native Hawaiian forest over large stretches of the upper lands. Especially in the koa belt the change from the former heavy forest to an open stand of rapidly-dying trees has been marked within the last few years. This condition is most noticeable on privately-owned lands in the center of the district that are used for grazing. It is not too late to redeem sections of this native forest if it were protected at once, but there

is no time to lose if it is to be saved. I strongly believe, and I so recommended to several of the owners, that, at least surrounding the water holes and swampy places, blocks of forest ought to be permanently maintained, sufficient in size to insure the continuance of both trees and undergrowth in healthy condition.

Kona is at best but very deficient in water supply. Every source is important. It ill behooves any landowner to let slip any opportunity, through protecting the native forest and through tree-planting, to conserve what sources of supply there are, and there is no question that the time for such action is now.

Tree-planting is also going on successfully on the other side of Hawaii. As a result of my visit in April to the Kukaiau ranch in Hamakua, I drew up early in May a statistical report on that project, for the information of the board and for future reference.

I am glad, in this connection of tree-planting, to call attention to several good-sized orders for seedling trees that have recently been placed with the Division of Forestry by sugar plantation companies. Details in regard to these orders will be found in the report of the forest nurseryman, which as usual is transmitted herewith.

FOREST RESERVES.

Several matters connected with the delimitation and administration of forest reserves have received attention during the month, more particularly on the islands of Hawaii and Oahu, together with about the usual amount of routine and retail. At a meeting of the commissioners held on May 8, two volunteer forest rangers were appointed, respectively for Manoa Valley, Honolulu, and for the Honolulu Watershed forest reserve in general, Messrs. E. H. Hipple and Charles L. Beal. Through the coöperation of these non-salaried officials it is hoped to secure better protection for the government land in this important forest reserve.

EXPERIMENTAL TREE-PLANTING.

Consignments of tree seed from foreign countries continue to be received from time to time by the Division of Forestry. Much of the seed now coming in is the result of requests made by Mr. J. F. Rock during visits to various botanic gardens in the Orient last winter. The seeds are being propagated and cared for at the government nursery and at the Makiki station.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, May 31, 1914.

R. S. Hosmer, Esq., Superintendent of Forestry.

Dear Sir:—I herewith submit a report of the principal work done during the month of May:

*Nursery.**Distribution of Plants.*

	In Seed Boxes.	In Boxes Transplanted.	Pot Grown.	Total.
Sold .....	....	400	261	661
Gratis	6000	890	1620	8510
	<hr/> 6000	<hr/> 1290	<hr/> 1881	<hr/> 9171

COLLECTIONS.

Collections on account of plants sold amounted to.....	\$ 1.25
Rent of building, nursery grounds, for the months of March and April	70.00
Total	<hr/> \$71.25

Plantation Companies and Other Corporations.

Under this heading we have received orders and distributed plants amounting to 19,400 in seed boxes, 1800 in transplant boxes and 50 pot-grown; total, 21,250.

We have also received an order for 50,000 eucalyptus seedlings to be delivered before the end of the year.

Experimental Garden, Makiki.

The work at this station has consisted principally of routine connected with the transplanting of seedlings, mixing and sterilizing soil and doing some needed repairs to the road leading to the station.

Honolulu Watershed Planting.

During the month 174 trees were planted out and 896 transplanted into tin cans. The species were all koa and kukui. The greater part of the month was spent in hoeing the trees previously planted.

Advice and Assistance.

The number of applicants for advice and assistance is as follows: By letter from the other islands, 4; by telephone, 6; calls for advice at the nursery, 7; calls made at the request of people in different parts of the city, 3.

Respectfully submitted,

DAVID HAUGHS,
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

Honolulu, June 9, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the Division of Hydrography for the month of May, 1914, is respectfully submitted:

KAUAI.

Weather conditions were most unusual. Much rain fell on the lowlands with but few storms. The mauka rainfall was very light in total, while the entire northern end of the island had almost continual rainfall. The clock register station on the Lumahai stream at an elevation of 750 feet was completed under conditions of almost continuous rainfall.

Rain gages, with evaporation gages, were established on the Lumahai and Kalihi-wai streams at the 750-foot elevation.

The clock register station on the South Wailua river near Lihue was found to be at a standstill. The cause was found to be a bees' nest in the float well, which contained a half bushel of honeycomb.

Work was started on the new Waioli stream clock register station trail on May 24. A station will be established on this stream (which is government water) at an elevation of about 700 feet. A new trail about $2\frac{1}{2}$ miles in length will have to be built to reach this station.

Fifteen stream-gaging stations and seven rainfall-measurement stations were visited during the month.

OAHU.

Oahu was well supplied with rainfall during the month. Records for the stations along the Koolau range were spoiled by being tampered with by unknown persons. It has been decided best to discontinue these stations and reestablish them at points

lower down in the Honolulu basin, off the trails and more centrally located in the rainfall catchment areas.

Two new clock register stations were constructed on the two main branches of the Manoa stream, above all diversions. The data to be obtained will be of immense value in connection with Honolulu's water supply.

The instrument was installed on the new clock register which was completed on the Punaluu stream in April.

Arrangements were made during the month for the installation of six new clock register coöperative stream-gaging stations, and one clock register ditch-gaging station. The stations are to be built during June and July, and are to be operated by this office. All equipment, material and construction cost will be borne by the coöperating parties, while the hydrographic division will oversee the construction and installation, and will maintain, operate and rate the stations in the future.

The coöperating parties are as follows:

Kahuku Plantation Co.—Three stations to measure the run-off of the main Malaekahana, middle branch of the Malaekahana, and Kahawainui streams.

Laie Plantation Co.—Two stations to measure the run-off of the Waialele and Koloa streams.

U. S. Army—One station to measure the run-off of the south fork of the Kaikonahua stream, below the storage reservoir of the Schofield Barracks water supply. Also one ditch station to measure the inflow from the ditch into the reservoir.

Ten stream-gaging stations and four rainfall-measurement stations were visited during the month.

MAUI.

Maui also received an unusual amount of rainfall during May, which was well distributed, and there were no large floods.

The old staff gage on the Waikapu stream was washed away, and a new gage was established at a new datum.

Thirty-two stream-gaging stations were visited and 36 measurements were made.

GENERAL.

The 1913 data have been completed, blue printed, and are now ready for distribution. Blue prints of data are being mailed to all public officials, plantations, ranches, etc., to whom these data may be of value.

Very respectfully,

G. K. LARRISON,
Superintendent of Hydrography.

THE KALO IN HAWAII (Conclusion).

By VAUGHAN MACCAUGHEY and JOSEPH S. EMERSON.

THE MAKING OF POI BY MACHINERY.

In recent years machine-made *poi* has been put upon the market. The Kalihi Poi Factory, in Honolulu, produces large quantities of this product. It is claimed by some that the machine-made *poi* is inferior in flavor and general quality to the hand-made *poi*, but the gain in sanitary methods of production greatly overbalances any such differences that may exist. Hand-made *poi* can be no cleaner than its makers, and those who have witnessed the methods of many "poi-shops" have indelible corroboration of this fact.

Machine-made *poi* is made thus: The corms are washed, boiled in large drums by means of steam, and peeled by hand. The peeling is done by women, working under sanitary conditions. The peeled corms then pass through a machine that resembles a gigantic meat-chopper, water is added as necessary, and the *poi*, of uniform texture, comes out of the bottom of the machine and is put into barrels.

OTHER USES OF THE KALO CORM.

In addition to this extensive use of *kalo* for *poi*, a considerable quantity is dried and ground into "taro flour" or "taroena". Taro flour has been on the market for several years, and is used successfully as food for infants, invalids, and other persons who require an easily-digestible food. About 70% of the peeled corm is water, so the shrinkage in drying is large. However, when once dried and ground, the flour will keep indefinitely, if protected from moisture, without becoming musty.

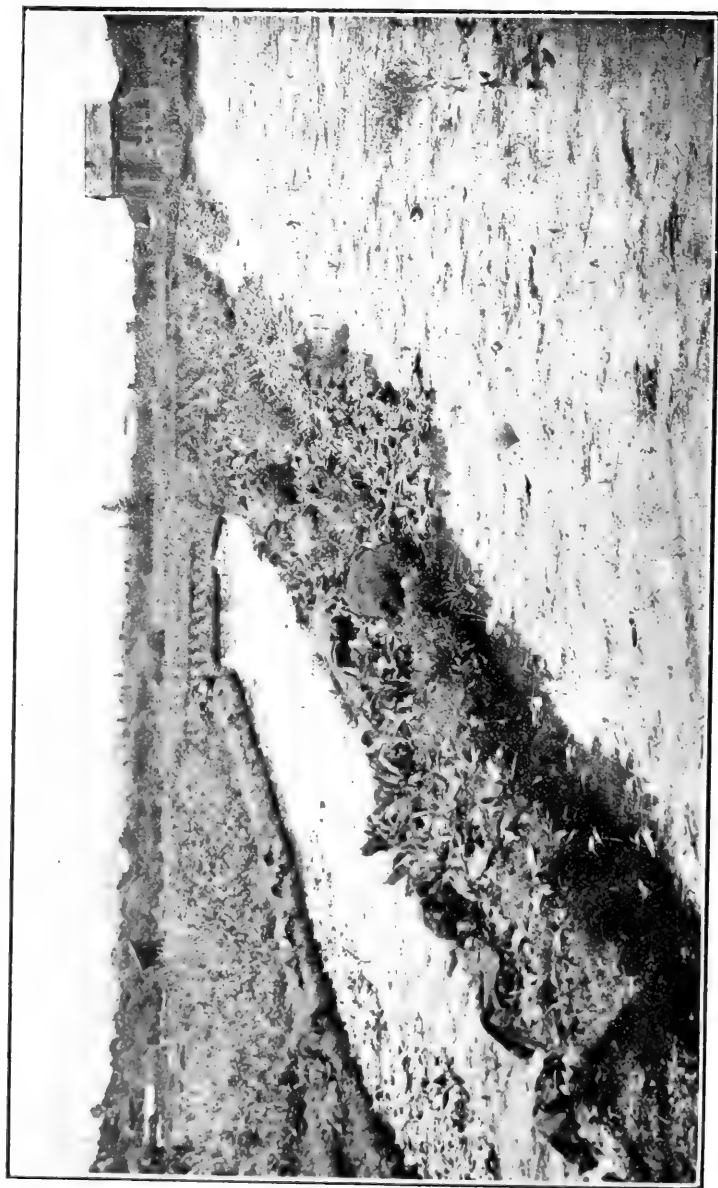
The following copy of the label on a "taro flour" produced locally will be of interest:

ARMSTRONG'S COOKED TARO FLOUR.

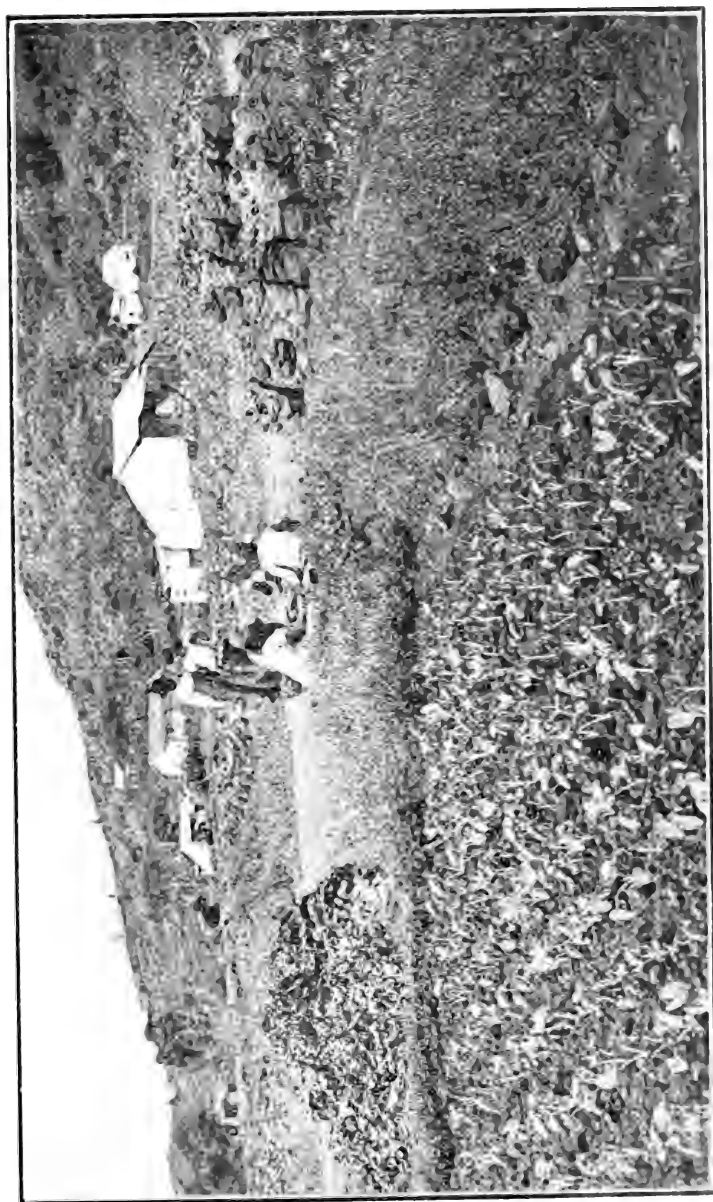
Prepared by McCandless & Armstrong, Pearl City, Territory of Hawaii. TARO FLOUR is made from the Taro Plant, the principal food used by the natives of the Hawaiian Islands. It is cooked, ready for use, has an agreeable taste and possesses more nutriment than any other known food. It can be mixed with milk or water. It is easily digested by the most delicate stomach and never rejected. It will keep in any climate; neither age nor insects affect its nutritive qualities. Recommended by all physicians.

DIRECTIONS FOR USING TARO FLOUR AS AN INFANT FOOD.

Infants under three months, one-half teaspoon of Taro Flour; cow's milk one-half pint, hot water one-half pint; dissolve the flour by adding to



HARVESTED FIELDS.
Note the gunny-sacks filled with cobs; the leaves cut off and thrown into the patches; the distant ocean and harbor.



KALO READY FOR TRANSPORTATION.

Near good wagon road; sacks of corn; pile of leaves for suture food; fields of young kalo; workmen handling; Cho-
 meo cabins; steep valley walls.

the hot water slowly; stir until well mixed, then add the milk. If lumpy, strain before using. For younger infants use more water. For older infants use more milk and less water. Mothers can use their own judgment in preparing the food. Once tried, always used. Unequaled as a food for dyspeptics and invalids. No distress after eating it. It contains no mixture. Is made of selected Taro only. Made under sanitary conditions and warranted pure Taro Flour.

DIRECTIONS FOR USING TARO FLOUR AS AN INVALID'S FOOD.

Two tablespoonfuls of Taro Flour in a glass of milk; stir well; add sugar or salt to taste.

Poi—Cook as mush and eat with milk or let stand one or two days until a little sour. Eat with meat or fish cold. For a drink, put two or three spoonfuls in a glass of water. It is very refreshing in the morning.

Can be used as other flours for mush, but for cakes, doughnuts or bread add a little wheat flour.

In case of seasickness it is the only satisfactory food.

THE FORCING AND BLANCHING OF DASHEEN* SHOOTS.

Abridged Statement by Robert A. Young, Bureau Plant Industry,
U. S. D. A.

"As the growing of the dasheen as a tuber crop begins to assume commercial proportions, it seems desirable to make available to growers and others who may be interested the details of a special treatment of the corms (large spherical tubers) by which a delicate fresh vegetable for winter use may be obtained. Credit is due to Mr. P. H. Dorsett, of the Bureau of Plant Industry, for the original suggestion of raising the shoots in this way.

"The young blanched shoots of the dasheen make a very tender and delicious vegetable and are used much like asparagus. The flavor is delicate and is suggestive of mushrooms. In order to destroy a slight acidity, a special method of cooking is required.

Culture.

To obtain the shoots, corms weighing 2 to 3 pounds or more, are planted in a fairly warm place in very moist sand or sandy soil. A half-and-half mixture of sand and ordinary potting soil has given good results. The corms are just covered, the terminal bud being at the surface. Provision must be made for keeping the shoots in total darkness from the time they begin to grow. Water should be supplied often enough to keep the sand or soil continuously moist.

Several ways of forcing and blanching dasheen shoots have been tried, and all have been successful in that satisfactory shoots were

* In this abstract *dasheen* is used as synonymous with *kalo*.



CORM OF PITALIA FLAUIA.

Weight: 598 grams. Dimension: 15.5 cm. x 8 cm.

grown. In the first experiments made by the Department, both sand and sphagnum moss were used in which to plant the corms. In one of these blanching was accomplished by keeping the shoots covered with sand, while in the others a frame covered with several thicknesses of burlap was used. The boxes in which these experiments were carried on were placed in a warm greenhouse on a bench that was supplied with bottom heat.

"Neither of the foregoing methods is adapted for use where the production of shoots on a large scale is desired. For such a case, provided the weather is not too cold and a suitable greenhouse is available, a bed may be prepared under a bench. The space may be darkened by hanging several thicknesses of heavy paper or burlap from the sides of the bench. This plan is suited to the spring of the year, while those methods by which bottom heat can be applied may be used at any time after the corms become available, in the late fall or early winter.

"The method which is probably best for large scale production is to use a raised bed provided with bottom heat. A cover, practically light proof and with sides 18 to 24 inches high, is required. The temperature inside this should be about 70°F. The soil (or sand) should be a little warmer, say, 80°. To obtain this temperature it is best to partially inclose the space beneath the bed.

"The first crop of shoots is usually ready for cutting in 35 to 40 days after planting. From 6 to 10 cuttings can be made at intervals of 10 to 14 days, depending upon temperature and the size of the corms used. The shoots are cut close to the corm, and, as far as practicable, before the leaves begin to expand. They will then usually be 8 to 16 inches long.

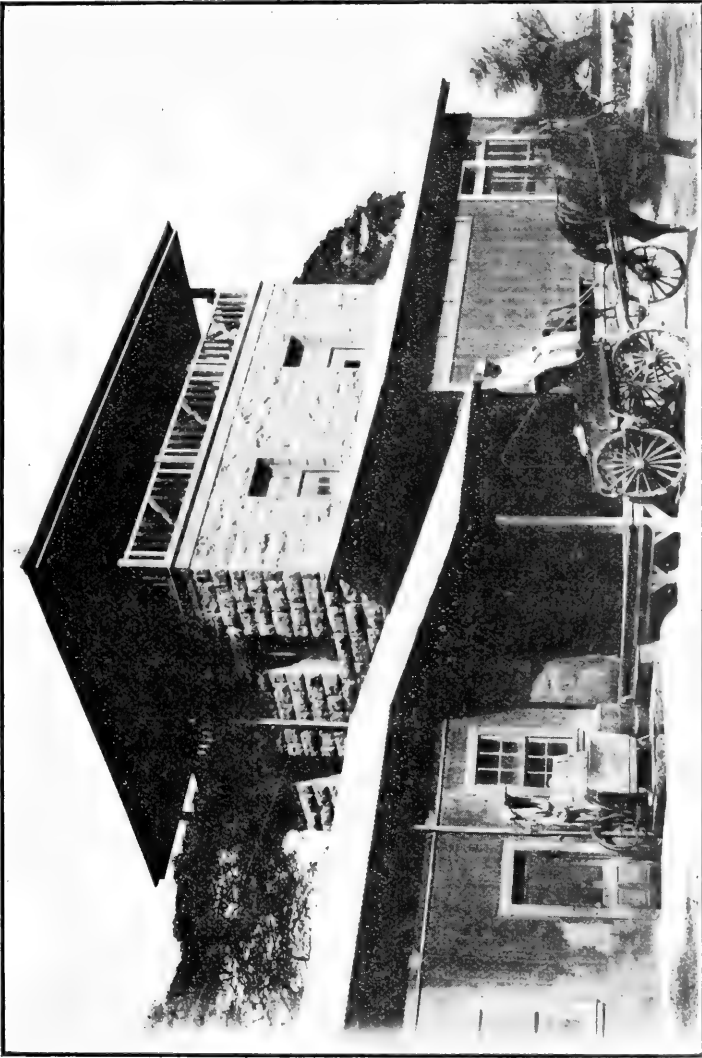
"After the corms become exhausted, which is indicated by the weak growth of the shoots, they are discarded.

"Out of doors in a warm region, as in Florida, the corms may be planted in rows in sandy soil and the shoots blanched by ridging up the soil as growth progresses. Instead of ridging the soil, boards may be used, as in blanching celery, but the shoots must not at any stage of their growth be exposed to light for any considerable length of time.

Handling and Keeping.

"The shoots have been found to keep well for several days if in a cool, dry place. As they are very succulent, however, it is better that the period of storage be very limited—not over two to four days when avoidable. A little ventilation is necessary, but as the shoots soon wilt if evaporation is too rapid, a paraffined paper should be used in wrapping and a slight opening left.

"Sometimes, when the shoots are to be kept for only a day or two before using, it may be advisable to wrap first in wet paper and then with paraffined paper, especially if the place where they are to be kept is not quite cool enough.



THE KALIHĪ POI FACTORY, HONOLULU.

The machinery for making the *poi* is housed in the central stone structure. The open upper floor contains water tanks. The second floor contains the steel drums in which the corns are cooked. The ground floor contains the cleaning and grinding machinery. The wooden structure to the left is the boiler and engine room. The lean-to on the right is the business office. The porch against which the wagon is backed is the distributing or selling area. Several barrels of *poi* may be seen on this porch.

RECIPES FOR THE PREPARATION OF THE DASHEEN.

"This vegetable is a staple article of food for millions of people in tropical and subtropical countries. In general it is used in the different ways in which the white potato is used. It may also be candied like the sweet potato. The flesh of the corms and large tubers is frequently somewhat gray or violet when cooked, but this does not affect the flavor.

"When uncooked dasheens are being scraped or pared they should be handled in water to which a teaspoonful of sal soda to the quart has been added, in order to prevent irritation to the hands.

Baked Dasheens.

"Dasheens, large or small, may be baked like potatoes, in a quick oven. They should first be washed and scrubbed to remove the fibrous part of the skin. When practicable to do so it is often desirable to scrape the dasheens before baking, as they are then more convenient for eating and the soft crust which forms when they are properly baked is particularly delicious. The corms may be cut in half from top to base in order to lessen the time needed for baking. The time required is about the same as for potatoes of the same size. They should be served hot. Season with salt and plenty of butter, and pepper if desired. Gravy instead of butter may be used.

"The dasheen when properly baked and served is mealy and the flavor is much like that of the white potato, but more or less suggestive of chestnuts. If not overbaked, the skin when properly scrubbed or scraped beforehand will be found of delicious flavor. As the dasheen is drier than the potato it requires more butter.

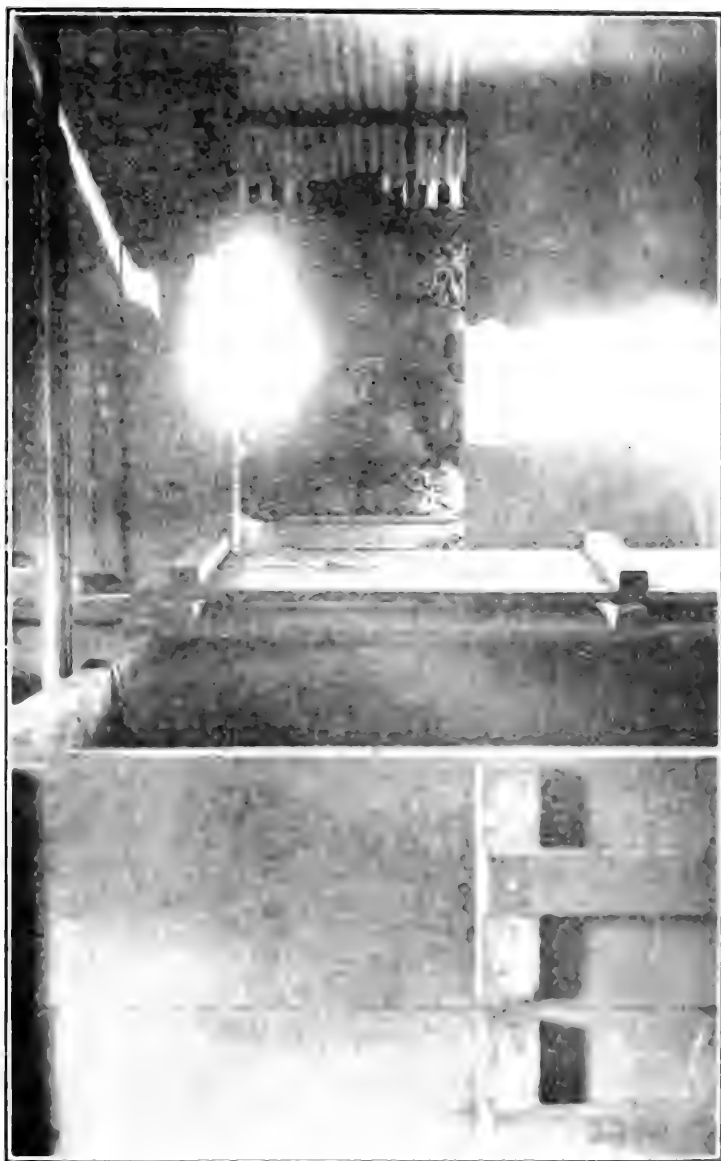
Stuffed Dasheens.

"Proceed the same as in baking, and when the dasheens are done follow the method used for stuffed potatoes, using more butter, however. If cream instead of milk is used for moistening, still better results are secured.

"The corms are especially adapted for serving in this manner, but they should always be scraped and, unless quite small, may be cut in half. Instead of mashing dasheens it will always be found better to scrape them with a potato scraper or to rub them through a coarse sieve.

Scalloped Dasheens.

"Pare raw dasheens and slice thin, putting in layers in a well-buttered baking dish, seasoning each layer with salt and butter and sprinkling each lightly with flour. Nearly cover with rich milk and bake.



KATILL POH JAGTUNEN.

View in washing room, looking across vats through doorway into receiving room. The washing vats are of wood, and are about four feet deep.

"This method of serving the dasheen will be found particularly well adapted for banquets and formal dinners, but in such case individual baking dishes or casseroles should be used.

"The above recipe may be varied by using less butter and adding grated cheese. Pepper may also be used in seasoning if desired. Cold boiled instead of raw dasheens may also be utilized in these recipes."

KALO FOR STARCH.

Kalo is not suitable for the manufacture of starch, for the grains are very small, being only 1/25,000 to 3/25,000 of an inch in diameter. The small size of the starch grains prevents their rapid settling in water, in which the grated corm has been put, so viscid that the starch grains will not settle. The manufacturing value of a starch depends, of course, largely upon this ability to settle in water.

The ancient Hawaiians used the kalo for a variety of purposes, in addition to its fundamental use as food. Kalo was used as a medicinal agent; was an important accessory in many of the *kahuna* practices; and a number of the varieties were especially suitable for offerings to the gods or *aumakua*.

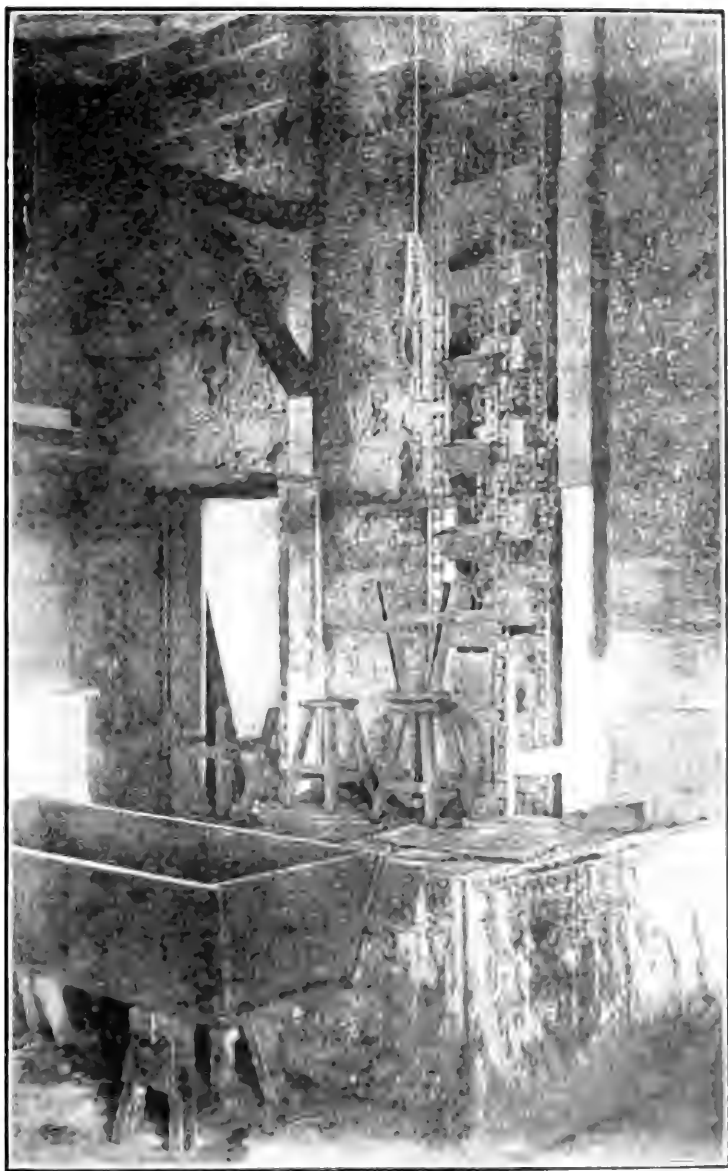
KALO FOR MEDICINE.

The medicine or *apu* was used for various pulmonary disorders. *Apu* refers primarily to the cup fashioned from a well-ripened coconut shell cut longitudinally, used for drinking awa and other unpleasent liquids, but not employed for ordinary drinking water. *Apu*, the medicine drunk from such a cup, was prepared as follows: A kalo corm is used preferably of the variety called *kalo-lau-loa-hauliuli*. This is much less acrid to the taste when raw than other varieties of kalo. Other varieties having a similar characteristic are used. The corm was grated by scraping off portions with an *opihī*, limpet shell. To this was added grated coconut, and the pasty mass was well mixed with some water and strained in the same manner as *awa*. The strainer used was the dry fiber of the *ahu awa*.

The pulpy mass was enclosed in this fiber and the liquid forcibly wrung out. The refuse was shaken out of the fibers of *ahu awa*, which were now arranged in the shape of a funnel. On being poured through this strainer thus adjusted, the liquid came out quite clear.

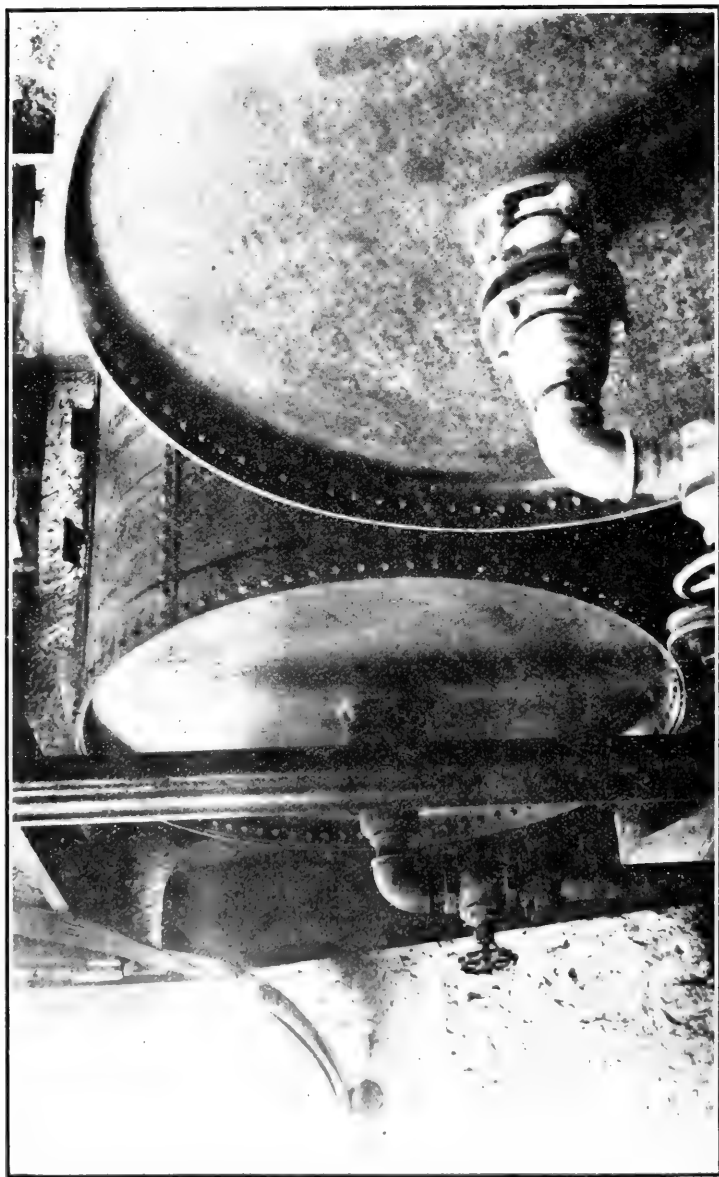
Seeds from the *pilikai* (*Agregia tilaefolia?* *Ipomea Turpenthum?*) were finely pulverized and mixed with a portion of the liquid in the proportion of about a teaspoonful to a tumblerful of the liquid.

For four successive mornings the patient takes a cup, *apu*, of the liquid without the *pilikai*, and on the fifth morning a cup of



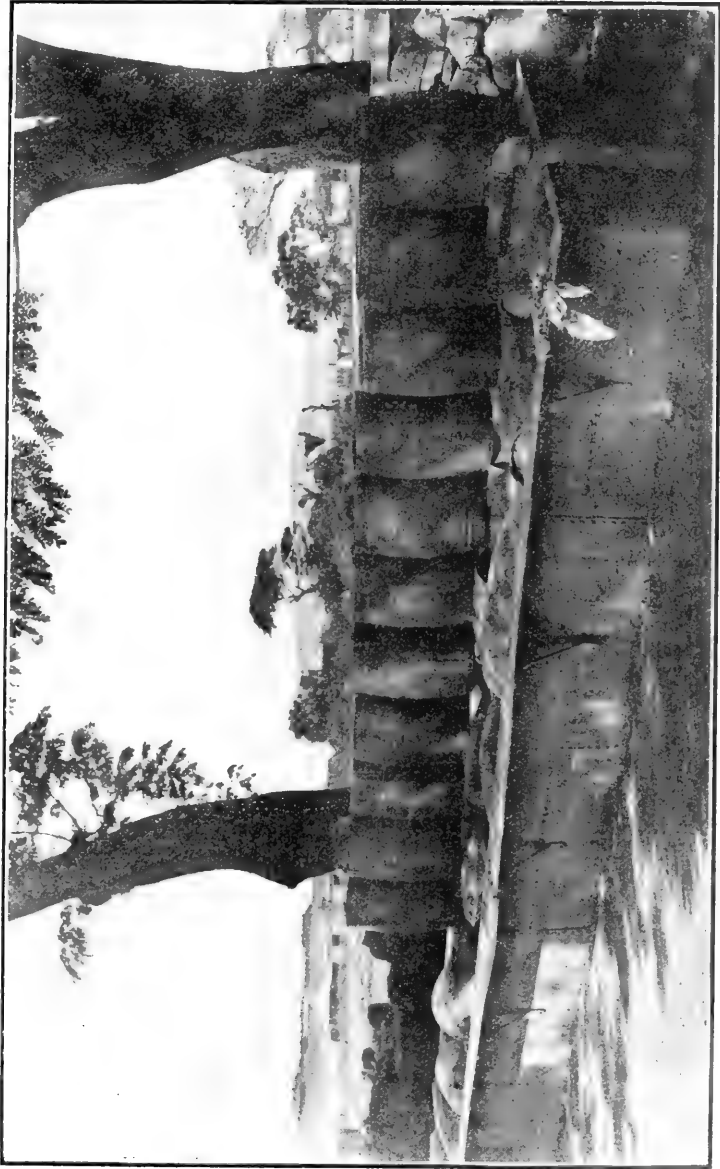
KALIHI POI FACTORY.

Another view in washing room, showing cement floor, a small vat, and endless-chain elevator for transporting the washed corns to the cooking drums on the second floor.



KALJIJI POI FACTORY.

Revolving drums, in which the corns are cooked by means of steam. Note conveyor over the drums; steam pipes, and device for revolving the drums.



KALAHU POI FACTORY.

Sheet-iron tank in which the poi barrels are thoroughly cleaned in scalding water. By this treatment the barrels are used repeatedly, like milk bottles.

the same to which the *pilikai* has been added. These five cups are respectively called: *kua-kahi*, *kua-lua*, *kua-kolu*, *kua-ha*, and *kua-lima*. The *kalo* is the efficient medicinal agent relied upon. The coconut is added simply to neutralize the acrid taste of the *kalo* and make the medicine more agreeable to the taste. The *pilikai* serves as a powerful cathartic to remove the last trace of the medicine from the system.

KALO FOR KAHUNA RITES.

The following varieties of *kalo* were all considered suitable for the various *kahuna* practices of ancient times, and for offering to the gods, *aumakua*:

Lauloa manini. This *kalo* is considered to be the best of all for *kahuna* purposes.

Piialii. Three kinds; two are for *kahuna* practices—*Piialii ulaula*, *Piialii keokeo*.

(*Piialii melemele*—yellow—is not used by the *kahuna*.)

Manini ha kikokiko.

Ha'okea. Three kinds; all used by the *kahuna*—*Ha'okea hau-liuli*, *Ha'okea keokeo*, *Ha'okea hau laula*.

Popolo.

Apūkea.

Icic.

Uahi-a-pele.

Kumu-ulaula; keokeo.

Only the *oha* or offspring of the central corm were used. These corms when small were roasted on hot coals and all the burnt portions were scraped off with an *opihi* (patella) shell or a knife. *Lu'au* made from the leaves of any of the above list were also used for the same purpose.

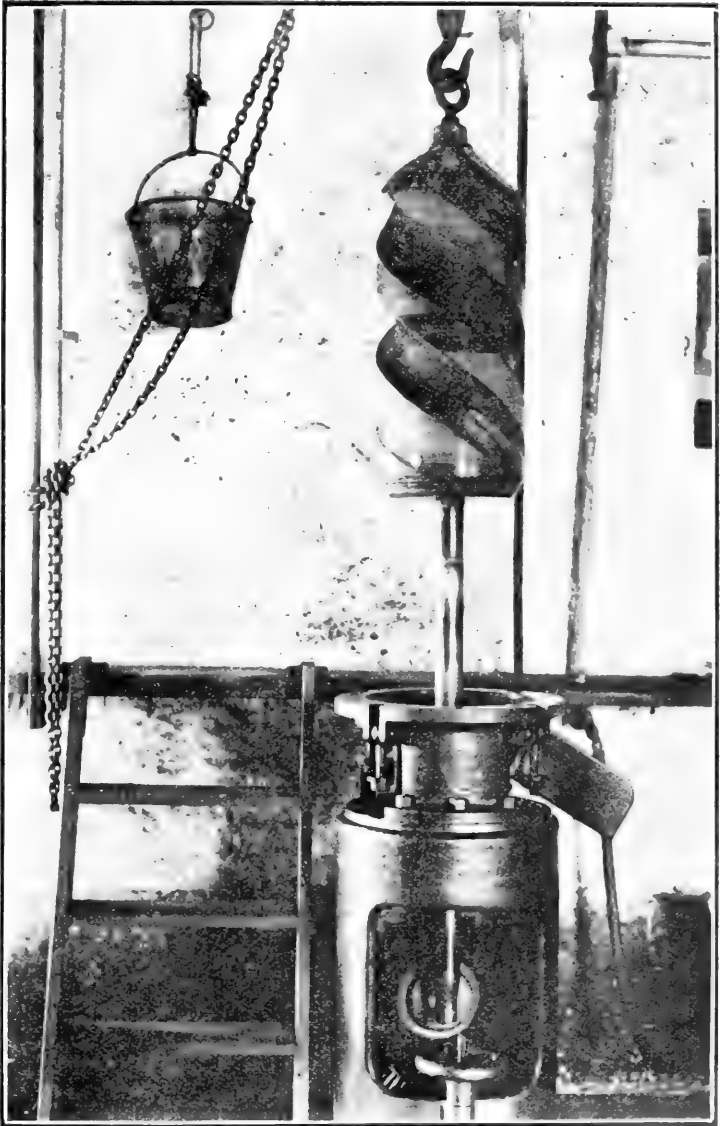
The Hawaiians made a pudding called *ku-lolo* of *kalo* and coconut, which is very good. Another dish is prepared by grating, *olo*, the corm on a rough stone, and then cooking it. This is called *piepiele*.

ADDENDA 1. WORK OF HILO BOARDING SCHOOL.

Glenwood.

Professor MacCaughey.

Dear Sir:—There occurs a statement in your article on taro which is founded on a misconception and which I would like in some way to have corrected. You state that the U. S. Experiment Station is collecting and planting varieties obtainable at the present time. This is unjust to the Hilo Boarding School, which is the institution doing this work, and has at the present time about sixty separate varieties under cultivation. I wish, therefore,



KALIHI POI FACTORY.

After thorough cooking the corms are peeled by hand, sorted, and fed into this grinding machine. During the grinding process water is added in sufficient quantities to give the proper consistency. The grinding is done by the large vertical screw-shaped pestle, which revolves in a cylindrical chamber.

you would be so good as to have a note inserted in the Forester giving the Boarding School credit for the really excellent work that Mr. Lyman has been carrying on since long before I ever heard of the institution, in spite of the fact that I seem to have come in and carried off the glory. Yours very truly,

F. A. CLOWES,
Superintendent Hawaii Substations.

ADDENDA 2. THE NAME "DASHEEN".

Washington, D. C., January 24, 1914.

Dear Prof. MacCaughey:—In connection with our use of the name "dasheen," I would say that while I had a feeling when in Hawaii that we might find it advisable to drop this name and take up the better known name "taro," I found that there was a rather strong feeling on the part of a good many persons that we ought to stick to the name "dasheen," particularly as the plant had become fairly well known under that name in a good many places. Various other arguments have been advanced both for and against the retention of the name, but my superiors finally decided that the name should be retained.

The derivation of the word is now easily traced to the French, and this case seems to be precisely similar to that of the origin of the French word for turkey, *dinde*, which was originally *d'Inde*. I realize that those who have known the taro will hardly become reconciled to this word dasheen, but as comparatively few people on the mainland are acquainted even with the former word, and many thousands are now more or less familiar with the name dasheen, I think the question is probably settled here for all time. Very sincerely yours,

R. A. YOUNG,
Scientific Assistant.

(The End.)

*ALFALFA—A PROMISING FORAGE CROP FOR
HAWAII.*

(Continued.)

The following tables show the exact amounts expended on the alfalfa field, the actual cost of production, and the total yields up to June 1, 1913—nine months and ten days after seeding:

COST OF PRODUCTION.

POISONING.

Formula:

5 lbs. bran at 1.5c.....	\$.075
5 lbs. mid's at 1.5c.....	.075
1 lb. brown sugar.....	.05
1 lb. white arsenic.....	.05
1 qt. water.....	...
Total	\$.250
Cost per $\frac{1}{8}$ -acre plot (3 times quantity).....	\$.75
Cost per acre	6.00

WEIGHING.

Per cutting per $\frac{1}{8}$ -acre plot—2 men, 1 hr. at \$1.50	
per 9-hour day	\$.33
Per cutting per acre.....	2.64

IRRIGATION (FLOODING).

UTAH—Plot No. 1				ARABIAN—Plot No. 2				KANSAS—Plot No. 3				AUSTRALIAN—Plot No. 4			
Date	Amt.	Cost		Date	Amt.	Cost		Date	Amt.	Cost		Date	Amt.	Cost	
1912	Hrs.			1912	Hrs.			1912	Hrs.			1912	Hrs.		
Sept. 1...	2	\$.33		Sept. 1...	2	\$.33		Sept. 3..	2	\$.33		Sept. 3..	2	\$.33	
" 15...	2	.33		" 15...	2	.33		" 16..	2	.33		" 16..	2	.33	
" 26...	2	.33		" 26...	2	.33		" 26..	2	.33		" 26..	2	.33	
Oct. 17...	1	.16													
1913				1913				1913				1913			
Mar. 6...	2½	.41		Mar. 5...	2	.33		March 4..	3	.49		March 3..	2¼	.37	
Per Plot, 1¼ Acre... Total	9½	\$ 1.56			8	\$ 1.32			9	\$ 1.48			8¼	\$ 1.36	
Per Acre (Cal.)	76	\$12.48			64	\$10.56			72	\$11.84			66	\$10.88	

WEEDING AND CULTIVATION.

VARIETY	UTAH			ARABIAN			KANSAS			AUSTRALIAN		
	Date	Amt.	Cost	Date	Amt.	Cost	Date	Amt.	Cost	Date	Amt.	Cost
Planet Jr.....	1912 Sept. 5...	2	\$.33	1912 Sept. 5...	2	\$.33	1912 Sept. 5...	2	\$.33	1912 Sept. 5...	2	\$.33
"	" 17...	2	.33	" 17...	2	.33	" 17...	2	.33	" 17...	2	.33
"	" 22...	2	.33	" 22...	2	.33	" 22...	2	.33	" 22...	2	.33
Hand.....	Oct. 14...	9	1.50	Oct. 15...	9	1.50	Oct. 16-17...	9	1.50	Oct. 17-18...	9	1.50
"	Nov 1-3...	9	1.50	Nov. 4-8...	9	1.50	Nov. 8....	9	1.50			
"	" 14...	2	.33	" 15...	2	.33						
Planet Jr.....	1913			1913								
"	1/29-2/7...	2	.33	Jan. 20...	3	.49	Feb. 10-18...	2	.33	1913 Feb. 20-25...	2	.33
"	3/27-4/1...	2	.33	Mar. 4-5...	2	.33	Apr. 17-25...	2	.33	4/28-5/14...	2	.33
"	May 19...	2	.33	Apr. 9-16...	2	.33	May 22...	2	.33			
"				4/28-5/4...	2	.33						
Total per Plot.....		32	\$ 5.31		35	\$ 5.80		30	\$ 4.98		19	\$ 3.15
Tl. per Acre (Cal.)...		256	\$42.48		280	\$46.40		240	\$39.84		152	\$25.20

ACTUAL YIELDS OF FODDER PER 1/8-ACRE PLOTS.

UTAH				ARABIAN			
Plot No. 1—Sown August 20, 1912				Plot No. 2—Sown August 21, 1912			
Cutting	Date	Yield, Lbs., Green	Calculated Tons per Acre		Yield, Lbs., Green	Calculated Tons per Acre	
			Green	Hay		Green	Hay
	1912						
1	10/26	40	.16	.03	94	.38	.07
2	11/1	189	.75	.15	173	.69	.14
3	12/10-16	637	2.55	.51	672	2.69	.54
	1913						
4	1/29-2/7	1178	4.71	.94	* 574	2.30	.46
5	3/27-4/1	2172	8.69	1.74	298	1.19	.24
6	5/19	2310	9.24	1.85	1115	4.46	.89
					1036	4.14	.83
Total.....		6526	26.10	5.22	3962	15.85	3.17

* Plants over mature; had begun to collapse.

ACTUAL YIELDS OF FODDER PER 1/8-ACRE PLOTS.

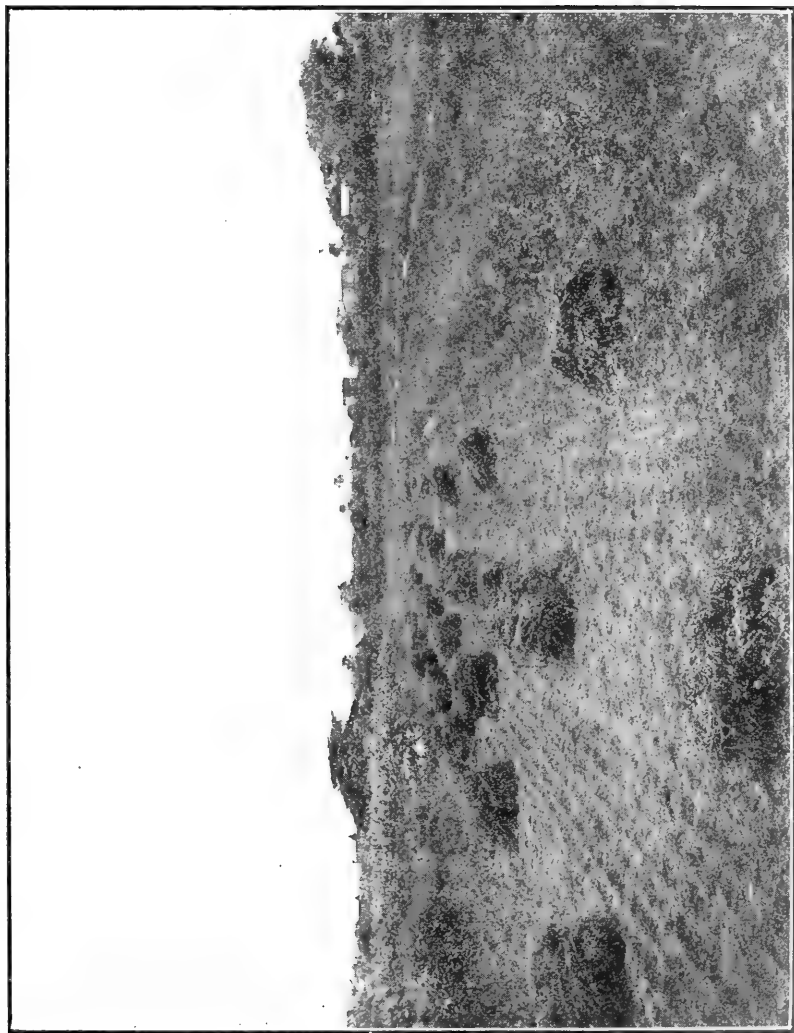
KANSAS						AUSTRALIAN			
Plot No. 3—Sown August 22, 1912			Plot No. 4—Sown August 22, 1912						
Cutting	Date	Yield, Lbs., Green	Calculated Tons per Acre		Cutting	Date	Yield, Lbs., Green	Calculated Tons per Acre	
			Green	Hay				Green	Hay
1	1912 10/16-17	160	.64	.13	1	1912 10/18	167	.67	.13
2	11/8	186	.74	.15	2	11/12	260	1.04	.21
3	12/17-20	765	3.06	.61	3	12/24-30	603	2.41	.48
4	1913 2/10-18	927	3.71	.74	4	1913 2/20-25	625	2.50	.50
5	4/17-25	1838	7.35	1.47	5	4/28-5/14	2096	8.38	1.68
6	5/22	2076	8.30	1.66					
Total.....		5952	23.80	4.76	Total.....		3751	15.00	3.00

COST OF PRODUCTION PER ACRE.

Variety	Utah	Arabian	Kansas	Australian
*Plowing (one deep).....	\$ 5.00	\$ 5.00	\$ 5.00	\$ 5.00
*Discing (3 times).....	5.00	5.00	5.00	5.00
Inoculation	2.00	2.00	2.00	2.00
Land Rental (yearly).....	20.00	20.00	20.00	20.00
Seed at 15 lbs. per Acre....	3.25	3.25	3.25	3.25
Seeding (drilling)	2.50	2.50	2.50	2.50
Reseeding and Seed.....	1.00	1.00	1.00	1.00
Irrigation	12.48	10.56	11.84	10.88
Weeding and Cultivation....	42.48	46.40	39.84	25.20
Poisoning	6.00	6.00	6.00	6.00
Harvesting at \$5.....	30.00	35.00	30.00	25.00
Weighing, etc., at \$2.64....	15.84	18.48	15.84	13.20
Total Cost	\$145.55	\$155.19	\$142.27	\$119.03
Total Receipts at \$5 per Ton Green	\$130.50	\$ 79.25	\$119.00	\$ 75.00
Total Receipts at \$27 per Ton Hay	\$140.94	\$ 85.59	\$128.52	\$ 81.00

* Including depreciation of machinery.

(To be Continued.)



Harvesting alfalfa at College farm, July, 1913, yielding at the rate of over 8 tons of green fodder per acre. Total acre yield for year ending December, 1913, 69,200 pounds green fodder.

BY AUTHORITY.

AMENDMENT TO RULE XVIII OF THE BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY CONCERNING THE CONTROL OF FUNGUS DISEASES ON PINEAPPLES.

The Board of Commissioners of Agriculture and Forestry of the Territory of Hawaii hereby amend Rule XVIII of the Board of Commissioners of Agriculture and Forestry concerning the control of fungus diseases on pineapples by changing the words "Island of Kauai" wherever the same appear, to read "Islands of Kauai and Oahu," so that the said Rule shall read as follows:

The Board of Commissioners of Agriculture and Forestry of the Territory of Hawaii hereby makes the following rule and regulation for the purpose of preventing the spread of a fungus disease upon pineapples which has made its appearance upon the Islands of Kauai and Oahu:

SECTION 1. All persons and corporations are hereby prohibited from carrying, transporting or shipping from the Islands of Kauai and Oahu to any other Island in this Territory any pineapple fruit, pineapple plant or pineapple sucker.

SECTION 2. No pineapple fruit, pineapple plant or pineapple sucker shipped from any port of the Islands of Kauai and Oahu to any other port in this Territory shall be allowed to be landed. Inspectors and other duly appointed agents of the Board of Agriculture and Forestry are hereby empowered to examine and inspect all freight, baggage and belongings arriving at any port of the Territory from the Islands of Kauai and Oahu and to destroy any and all pineapple fruits, plants or suckers found among such freight, baggage or belongings.

SECTION 3. Any persons violating the above rule shall be guilty of a misdemeanor and upon conviction thereof shall be punished by a fine not to exceed Five Hundred Dollars (\$500.00) as provided by Section 390 of the Revised Laws as amended by Act 82 of the Session Laws of 1905, and Act 112 of the Session Laws of 1907.

SECTION 4. This amendment shall take effect upon its approval by the Governor.

Approved:

(Sgd.) LUCIUS E. PINKHAM,
Governor of Hawaii.

Honolulu, Territory of Hawaii, June 30, 1914.

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Board of Agriculture and Forestry

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The Board of Commissioners issues for general distribution to persons in the Territory, annual reports, bulletins, circulars, copies of its rules and regulations, and other occasional papers, which may be had, free, upon application.

A complete list of the publications of the Board available for distribution (together with the titles of certain issues now out of print) is to be found on the cover of the last biennial report.

Applications for publications should be addressed to the Mailing Clerk, P. O. Box 207, Honolulu, Hawaii.

DIVISION OF HYDROGRAPHY.

Rooms 20-22 Kapiolani Bldg. Tel. No. 3662.

The Division of Hydrography has on hand free publications relative to the water resources of the Hawaiian Islands. These publications furnish detailed data as to daily, monthly, mean, maximum, and minimum run-off of streams and ditches, and also cuts and maps pertaining to the different islands. Much descriptive data relative to the mountain ranges and physical configuration of each island are also contained. These publications will be mailed free of charge on request.

The United States Geological Survey topographic map of Kauai is also on sale, and copies will be mailed on receipt of 50 cents.

The records and maps of this division are available for inspection by any one who desires information relative to water resources, topography, etc. Blue print copies of hydrographic data relative to any stream, ditch, spring, etc., which may be under observation by this division will be mailed free of charge on request.

This division will also make ditch seepage losses and utilization investigations when the actual cost of the labor, materials, subsistence, transportation, etc., of such investigations is paid by those benefited.

G. K. LARRISON,
Superintendent of Hydrography.

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DIVISION OF FORESTRY.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent.

THE HAWAIIAN FORESTER AGRICULTURIST

VOL. XI.

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No. 8

POINTS ABOUT TIMBER FLUMES.

That the V-shaped timber flume is a more efficient type than the box or square-sided form is one of the conclusions reached by the department of agriculture in a bulletin just issued on flumes and fluming. The V-shaped wooden flume requires less water and, on the average, less repairs than the other type, is better adapted to act as a slide on steep grades, and offers fewer chances for jams. Concerning a third type, the "sectional" metal flume, semicircular in form, the prediction is made that it will come into wide use. Such a flume is strong and light, and can be quickly taken apart and transported from one place to another to be set up again.

When building flumes a good plan, says the department, is to erect a small sawmill at or near the upper end of the flume location to saw out the lumber needed for construction. Such material can be floated down the flume as fast as the latter is built and used for further extension.

For handling railroad cross-ties, cants, poles, cordwood, and the like, a flume with the sides of the V 30 inches in height is large enough. For handling logs, piling, long timber, or brailed sawed lumber, a height of from 40 to 60 inches is recommended. The best angle for the V is put at 90 degrees.

Proposed flume lines ought to be surveyed as carefully as a line for a logging railroad, to ensure evenness of grade. Grades should be kept below 15 per cent wherever possible, and the best results are obtained with grades between 2 and 10 per cent.

Abrupt curvatures in a flume should be avoided, for they are likely to cause jams. Curves should rarely be permitted to exceed 20 degrees. It may be necessary to blast out rocks and boulders, or projecting points of bluffs, or to trestle, or even tunnel, to eliminate abrupt curves or maintain an even grade.

Telephones are recommended as adjuncts to the operation of a flume. By their use a serious break or jam can be reported immediately to the head of the flume to prevent further shipment of material. A telephone also makes it possible to notify the men at the upper end of the flume just what material to ship and when to ship it.

A flume recently built on Rochat Creek, near St. Joe, Idaho, is cited as a good example of modern V-shaped flume construction. This flume, which is unusually large and built to handle heavy logs and long timbers, is said to have cost approximately \$8000 per mile for the five miles of its length, including the cost of constructing a wagon road and telephone equipment. Other flumes are cited costing from \$2000 to \$7500 a mile.

Dr. Norgaard's report for June contains matter that should be worth a great deal of money to intelligent hog raisers. It is a feature of this number of the Forester which has permanent value.

Accomplishment is of infinitely more value than agitation. What the Territorial veterinarian shows, in his May report delayed in publication here until now, regarding the check that has been given to tuberculosis among children in the municipality of Honolulu through the outlawing of diseased milk, forms a telling example of the value of decisive measures in fighting the plagues of humanity.

Dr. Norgaard should have all the backing he requires, from both the authorities and public-spirited citizens, in his campaign against filthy dairies and dirty milk therefrom.

Mr. Hosmer's review of his service in the Division of Forestry, reprinted in this number from a local daily, will interest friends of forestry abroad as well as here.

MR. HOSMER REVIEWS HIS WORK IN HAWAII.

Before leaving Honolulu to take up his new position, that of head of the Forestry School of Cornell University, Mr. Ralph S. Hosmer by request furnished the Honolulu Star-Bulletin with the following review of his work as Superintendent of Forestry of the Territory of Hawaii:

"During the past ten years the division of forestry has stood consistently for two main objects—(1) the protection and proper administration of the native Hawaiian forest on the important watersheds, and (2) the planting of economically valuable trees on non-agricultural and other waste land.

IMPORTANT ACHIEVEMENTS.

"The more important achievements of the division may be summed up as follows:

"The creation of a forest reserve system and the laying of the foundation for a proper administration of the forest reserves.

"A decrease of trespass on the forests by the extension of forest boundary fences, the eradication of wild cattle and goats in most of the reserves, and the awakening of public opinion as to the importance of these measures.

"The securing of general assent to the doctrine of tree planting on waste land, as evidenced by the establishment of many groves of trees and forest plantations throughout the Territory.

"An increase in popular knowledge and appreciation of certain valuable trees, and the keeping up of the agitation of the subject of the importance of systematic investigations with new trees and shrubs.

"The carrying on of a campaign of education as to the value and necessity of practicing forestry in these Islands, and further as to the intimate relation which the right use of the natural resources—popularly known as 'Conservation'—bears to the continued economic well-being of this Territory.

"The enactment of a forest fire law and the organization of a forest fire service.

"And some share in the strengthening of the general public sentiment in favor of forestry and forest work that has found expression in continued and increased support by the legislature.

PROTECTION OF FORESTS.

"The protection of the areas of native Hawaiian forest covering the important watersheds throughout the Territory has been sought through the creation of forest reserves. The essential object is to equalize and maintain the flow in the streams that feed the various ditch systems which make the water available for irrigation, power development, cane fluming and domestic supply. There are now 37 forest reserves owned in Hawaii. These reserves include both government and privately-owned land. The total area is 798,214 acres, of which 546,222 acres (68 per cent) belongs to the Territory. Twenty-eight of the reserves are essentially protection forests, primarily of value for safeguarding the cover of vegetation on watersheds. The other nine, almost all government land, were set apart that the areas included within their limits might eventually be brought under forest, or that the commercially valuable timber on them might be administered under the board of agriculture and forestry.

SYSTEM NEARLY COMPLETED.

"Technically, the Hawaiian forest reserve system has now been pretty nearly completed. Only a few comparatively small lands remain to be set apart to round out the forest area needed for the protection of the important streams. What has so far been accomplished is essential as the first step in the program, but to

secure the full benefits to be derived from the protection of the forest it must be followed up by systematic administration of the reserves, such as can only be secured by a forest ranger service. The immediate forest problem in Hawaii and the next step in the progress of forestry in this Territory is to get an effective field organization established and in working order.

"In large measure the boundaries of the forest reserves either consist of natural barriers or are fenced. Some of the fences are maintained under the requirements of government leases, some have been built and are maintained at government expense, and some are kept up voluntarily by corporations or private owners. The more important corners of a number of the forest reserves have been marked with metal monuments. All the forest reserve boundaries ought to be so defined.

"During the past two years the government has constructed a number of new fences. Several other stretches of fence required under leases have also recently been completed, and some other lines of forest fence have been erected at private cost. The general attitude of the public in regard to the protection of the forest has undergone a marked change in the past decade. While there is still more or less trespass going on on each island, the best sentiment is now strongly against it, rather than being hostile or indifferent as was the case previously.

"In a few of the reserves the forest is still being damaged by wild cattle and by goats, but in the last few years a very marked improvement has been effected on each of the larger islands in controlling this form of injury.

TREE PLANTING ENCOURAGED.

"The second main line of endeavor pursued by the division of forestry since 1904 has been the encouragement of tree planting. This the department has sought to do by supplying technical advice to all who desired it as to methods and means of nursery and tree-planting work, but furnishing free or at cost price tree seedlings of various species, and by a general campaign of education as to the desirability of establishing blocks of planted forest from the standpoints of commercial return, watershed protection or aesthetic considerations.

"Tree planting has been practiced in Hawaii both by the government and by private individuals and corporations for 30 years or more, but in the past few years there has been a marked increase in the number of trees set out and a much better understanding of the necessity for such work than at any time before. The doctrine of using for tree planting non-agricultural land on the sugar plantations that otherwise would be classed as waste area has been persistently preached, until it is now generally ac-

knowledgeed to be a sound policy to follow wherever it is possible to secure funds to defray the initial cost.

"In this campaign much has been written and printed, in regular reports, in the Hawaiian Forester and Agriculturist and elsewhere, both as argument and exhortation, and also in the way of concrete examples showing the profit to be derived from tree planting in terms of compound interest. Among this matter the bulletin entitled 'Eucalyptus Culture in Hawaii,' by Mr. L. Margolin, calls for special mention. This report gives the result of a coöperative study made by the Division of Forestry and the U. S. Forest Service in 1910. That the efforts put forth have really told is evidenced by the increase in the number of trees planted each year. In 1912, the last year for which full records are at hand, the number planted was well over a million and a quarter trees. For the credit of creating this sustained interest, the division of forestry has the right to claim a share.

PRAISE FOR DAVID HAUGHS.

"In this connection it is only fair to make mention of the part played by the forest nurseryman of the division of forestry, Mr. David Haughs, who has charge of the section of the division's work dealing with the growing and distribution of trees. From his long experience in the Islands, Mr. Haughs' suggestions on all matters relating to tree-growing are distinctly worth having. That this fact is appreciated is proved by the steady stream of applications for advice that come to the division. Giving assistance of this sort is one of the important functions of this office. It is an essential part of the Territory's forest work.

"The introduction and experimental planting of trees new to the Islands is a branch of forest work which it has been the aim of the division of forestry to foster, ever since its organization. Only by the actual trial of new trees and shrubs can it be known surely whether or not they will succeed here under our local conditions. The division of forestry has helped to make better and more widely known several species that had previously been introduced, especially Japanese cedar, certain of the eucalyptus, and a basket willow from the Azores. It has as well developed the use of ironwoods as a windbreak for canefields near the ocean, and has started upon the investigation of many new trees about which it is yet too soon to have positive information to give out.

"The forest fire law in Hawaii dates from 1905. Under its terms a forest fire service consisting of volunteer district fire wardens has been organized and kept strictly up to date. This skeleton organization has been effective in combatting all fires that have occurred and furthermore has gone a long way toward firmly fixing in the minds of the people generally that the Board of Agriculture and Forestry means business in its enforcement of

the terms of the forest fire law. A number of convictions have been secured, especially during the past three or four years, where fires had been allowed to escape through preventable carelessness. This action has had a salutary effect in certain sections of the Territory where the danger from fire was high.

"Very fortunately, Hawaii has suffered but little from forest fires. But in the leeward districts and in occasional dry years even in those normally subject to heavy rainfall, the danger of fire is always present. The time to make ready for fighting fire is before it starts. Hawaii is prepared.

RECOMMENDATIONS.

"Just how soon it will be possible to establish a regular service of forest rangers, paid by and responsible solely to the Board of Agriculture and Forestry, is a question of financial policy. But until such a force of efficient men is organized to patrol the reserves, prevent trespass, see that the fences are maintained, exterminate the remaining wild stock in the forests, and prevent forest fires, the Hawaiian forest reserve system will not be properly administered. This is now the first need in forestry in Hawaii.

"Next, the Territory is a long way yet from having enough groves and plantations of trees of economically valuable species. This is equally true of government and of privately-owned land. Fuel supply in certain districts, fence posts, railroad ties, bridge timbers and other lumber for rough work, to say nothing of construction timber, will always be required in Hawaii. With the diminishing wood supply on the mainland, the price of lumber will certainly not recede. It may make considerable advances. It has been demonstrated that there are trees well adapted to local conditions that can supply at least part of the local demand. It needs no argument to show the wisdom of establishing plantations of such species on land that cannot profitably be used for agriculture.

FOREST FIRE SERVICE ESSENTIAL.

"Along with the other forms of forest protection it is essential that the Territory keep up an efficient forest fire service. It will continue the duty of the division of forestry to see that the present forest fire organization is maintained, and when necessary expanded.

"There are, as well, many lines of forest investigation which it should be the policy of the Board of Agriculture and Forestry to encourage. The introduction of species of trees new to the Islands, the experimental planting of temperate zone trees on the high mountains, and enough publicity and educational work so

that the public shall be kept fully informed as to the necessity for forestry in the Islands and its needs, are all matters that should have attention.

"The practice of forestry must always continue to be one of the important functions of the Territorial government. On the foundation that has been laid in the past decade, may the division of forestry built strongly and well."

DIVISION OF ANIMAL INDUSTRY.

Honolulu, May 31, 1914.

The Honorable Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I beg to submit herewith a report on the work of the division of animal industry for the month of May, 1914.

The routine work of the division, covering the inspection of imported live stock and the testing, inspection, tagging, branding and destruction of dairy animals for the eradication of bovine tuberculosis is appended in the itemized reports of the assistant territorial veterinarian.

I only wish to add that the new method of testing with tuberculin has continued to give excellent results, and that there can be no doubt that this method will be adopted the world over as soon as it has been demonstrated and officially accepted. This statement is based upon the fact that I was the first official delegated by the U. S. Department of Agriculture in 1891 to test tuberculous herds with a view to eradicating the disease, and have since that time studied and practiced all developments along this line as well as investigated all new methods and propositions pertaining thereto. I do therefore believe that, when I say that our present method, as employed only here and as developed here, will prove the one most feasible and most economic, I am entitled to sufficient confidence to warrant that the method be given a thorough test wherever the question of the eradication of bovine tuberculosis may present itself.

This statement is made with a view to influencing the members of the board to act favorably upon my application for authorization to officially represent the board at the Tenth International Veterinary Congress which holds its quadrennial meeting at London, England, August 3 to 8 this year.

At this congress bovine tuberculosis will be the main topic to be discussed. England has just passed a law carrying with it immense appropriations for the suppression of bovine tuberculosis, and my aim would be to demonstrate before the representatives of the numerous countries which will be represented there that this disease can be controlled and suppressed without any

such appropriations, at least for reimbursement to owners of diseased animals, as has been fully demonstrated in the Territory of Hawaii. Not alone has this fact been demonstrated, but the vastly more important one—that is, that the mortality of children from tuberculosis can be greatly reduced by elimination of milk from tuberculous cows from the public market—has likewise been proved, by official figures computed independently of this office, viz., the statistics of the Territorial Board of Health and the Anti-Tuberculosis League. That a majority of the States in the United States, as well as most foreign countries, should still adhere to the cumbersome and expensive old subcutaneous tuberculin test is in itself remarkable, but that the entire principle upon which the ultimate eradication of bovine tuberculosis must be based—that is, that the consumer must pay for the clean milk he demands—should entirely escape the observation of the legislators, is more astounding. It has been proved here that the consumer is perfectly willing to pay one cent per quart more for milk guaranteed free from tubercular infection, and it has also been demonstrated that this small sum is sufficient to reimburse the milk producer, as a whole, for all losses sustained on account of condemned cattle destroyed.

All that is required is education, to make the consumer demand clean milk, and demonstrate to him that through clean milk he will save a far greater amount than the increased cost of the milk through reduced or eliminated doctors' bills, medicine bills, undertakers' bills and in the general satisfaction of seeing healthy children and persons around him. Consequently, the large appropriations for reimbursements, which are now the principal stumbling blocks upon which most sanitary measures for the purpose are wrecked, will no longer be required.

Our present method of testing appears to us to be infallible, and has so far been sustained by every post-mortem examination made. While unknown up to the present in either the States or Europe, it is so simple that any practitioner may stumble over it at any time and assume the credit which should be due this board.

The same applies to the intradermal mallein test for glanders. The United States Bureau of Animal Industry has just promulgated a new regulation, changing from the old subcutaneous test to what is known as the ophthalmic test. While the latter is simpler, under favorable circumstances, than the old one, it is, according to our observations here, applicable only in 50 per cent of all cases, in summertime at least. On the other hand, we have developed here an entirely new test, along the same lines as the intradermal tuberculin test, and which seems also to be infallible. Its only drawback would appear to be that it is too searching, that even the slightest, apparently cured old nodule, in the lunge, for instance, causes a reaction. But surely no case of glanders can possibly escape it, and the reaction begins almost immediately

after injection, so that in most positive cases it is possible to come to a conclusion within two to four hours after injection. At the same time, the method is so simple that even a stable boy can interpret the results, if he has once seen it applied, or if it has only been explained to him. This test consists in the injection into the hide on the side of the neck of two to three drops of the official Bureau of Animal Industry mallein. The injection leaves a small, well-defined swelling, the size of a pea, which soon begins to enlarge, so that, within an hour or two, it has reached the size of a nickel or, in positive cases, a quarter. If the disease, glanders, is not present in the system the swelling will from then on remain stationary, or only enlarge very little more during the next twenty-four hours, remaining cold and not sensitive to touch. But if the disease is present the swelling will continue steadily to enlarge, sometimes at the rate of half an inch in diameter per hour, and at the same time becoming hot and extremely sensitive to touch. After ten to twelve hours the swelling may be six to ten inches in diameter and raised from one to three inches above the surrounding tissues, with sharply-defined margins. It is easily seen that such a reaction is vastly more diagnostic than one which, like the new official eye test, depends upon the quantity of tears discharged from the injected eye, especially when both eyes are already inflamed and running as a result of a cold, shipping fever, influenza, strangles, or simply irritation by strong sunlight or flies.

That our intradermal mallein test would be adopted, were it presented before the congress in question, there can be no doubt, the results obtained at the last outbreak of the disease in this Territory—the Waipio Valley outbreak—having demonstrated its value in 36 cases. In at least twenty of these cases the ophthalmic test could not have been used on account of sore eyes. However, both of these new methods of testing have been reported to the board in many previous communications, and the present statement was written only with a view to emphasize the importance of bringing them before the public in an effective manner. For this reason also has no publication been made in any veterinary or scientific magazine or periodical up to this date.

In regard to the interrogation from the Board of Supervisors, through Dr. Wayson, as to the statement made by me in my last report to the effect that the local milk inspection "is a farce," I have been requested not to publish my reasons for this statement, but allow the city and county physician to look into the matter, on the basis of such information as I might provide him with on the subject. I would therefore respectfully request that, for the sake of future coöperation, I be allowed to deal directly with the city and county physician on this subject in order to assist him in straightening up the situation, which without doubt requires both disciplinary and corrective measures. The very fact that infan-

tile tuberculosis has diminished to such an extraordinary extent in the only district where tuberculous milk has been barred from access to the nursery and dining-room should be an incentive to see to it that this beneficial result is not offset by a high infantile mortality from the many summer complaints among the babies and children due to filthy milk.

Very respectfully,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT FOR JUNE.

Honolulu, June 30, 1914.

The Honorable the Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I beg to report on the work of the division of animal industry for the month of June, 1914, as follows:

A number of complaints of disease among hogs continue to reach this office, and during the past month examinations have been made in a number of herds in Honolulu and vicinity. Of these may be mentioned Frank Andrade's and Charles Bellina's, both in Kulionou; Kawahara's, in Waikakalua Gulch; a single case at the Girls' Industrial School, Moiliili; in all of which places post-mortems have been made, while at a number of other places the hogs are simply not doing well, while some small pigs are lost off and on.

In only one of these cases, the one at the Girls' Industrial School, were actual symptoms of hog cholera found on post-mortem, and as this was the only hog on the place or in the neighborhood the matter ended there with the disinfection of the premises. In none of the other cases that have come under observation, nor in any reported by practicing veterinarians, has it been possible to reach a definite conclusion as to the exact nature of the disease except faulty feeding, either too much swill, uncooked swill, too little green feed, too much rice bean or not sufficient quantities of nourishing food. There seems to be an idea among the hog raisers in Honolulu and vicinity that hogs can be raised on anything that may happen to be around and that it is waste of money to purchase feed for hogs. This idea undoubtedly originates with the swill-fed hog, which, under favorable circumstances, can be grown at very slight expense in comparison with the returns, and, while the careful and experienced hog raisers can produce pork by means of swill very cheaply, his success has led a number of absolutely inexperienced and ignorant Orientals to put everything they have into a small "hog ranch" and a swill wagon

and then think their fortunes are made. Swill—that is, the refuse and offal from kitchens of private houses, hotels, restaurants or military camps—is first-class feed for hogs when properly sorted or carefully collected, but failure to attend to this will always prove disastrous, especially in a hot climate. Furthermore, unless fed the same day it is produced, or at latest the following day, the swill should always be boiled or heated to the boiling point, during which process chopped green feed such as honohono or panicum grass should be added in equal quantities with the swill, or if this is very rich, that is, containing many meat scraps, the quantity of green stuff should be as two to one. A small amount of rice bran may be added, but to use this product as an exclusive feed or as the principal component of a daily ration has in my experience always given extremely unsatisfactory results. This is undoubtedly due to the high percentage of silicates (mineral matter) and the low actual feeding value.

As swill always contains a considerable amount of metal, especially solder and frequently the tin cans as well, and as fermenting swill soon begins to disintegrate the metal, producing various poisonous salts, there is always the danger of serious alimentary disturbances when swill is fed in large quantities from this cause alone, and regardless of the danger of ptomaine poisoning. This is fully borne out by both symptoms and post-mortem lesions, exhibited in a majority of all fatal cases of disease among swill-fed hogs. Constipation is more frequent than diarrhoea, while paralysis, muscular trembling and blindness all indicate lead poisoning. On post-mortem gastro-enteritis is the principal symptom, extensive hemorrhagic areas along the large and small intestines with numerous small patches on the mucous membrane, but no button-like ulcers, as seen in hog cholera. The liver and kidneys are pale and shrunken, and without the small blood spots characteristic of hog cholera. Nor is the spleen enlarged. There are, however, many variations in both symptoms and lesions depending upon the different poisons which may develop in swill. It will therefore be seen that swill is an extremely risky food for hogs, and still there are several large hog ranches on this island, especially in the neighborhood of the large military establishments, that are simply coining money by means of swill-fed hogs. But all of them have lost large numbers of hogs before they learned how to use it judiciously, and especially learned not to over-feed and to take all of the precautions already mentioned. Besides these it is imperative to ascertain that no lye or soap-powder or any other chemical preparation used in cleaning dishes and pans reaches the swill barrel, especially if the tin cans reach it also. Next is the prompt collecting of the swill, as early in the morning as possible, and the sorting of it immediately when the pens are reached in order to remove all lemons, oranges or other acid fruit, as well as all

metal cans, colored labels and other injurious ingredients. Then the swill is placed in the clean heating tanks with the requisite amount of chopped green stuff and whatever other feed may be raised on the place for the animals. To this should be added a small amount of salt, charcoal, sulphur, antimony, etc., as recommended as a preventive for hog cholera by the federal Bureau of Animal Industry, as follows:

Wood charcoal	1 lb.
Sulphur	1 lb.
Sodium chloride (salt).....	2 lb.
Sodium bicarbonate	2 lb.
Sodium hyposulphite	2 lb.
Sodium sulphate	1 lb.
Antimony sulphid or black antimony.....	1 lb.

These ingredients should be powdered by passing through a coffee mill or in a large mortar, thoroughly mixed, and of the mixture a heaping tablespoonful should be added to the feed for every 200 pounds of hog in each pen. This prescription is repeated here because good results have been seen wherever it has been used, provided all the other precautions have been taken. But the medicine alone will not do it.

The fact remains, however, that hog cholera still exists on this island, and, even though there is not much of it or else that the hogs here have nearly all become immune, it cannot be advised to remove the restrictions against the shipping of hogs from this island to the others, for some time to come. Nor is there sufficient hog cholera to warrant the recommendation of serum immunization on a large scale so long as the price of serum remains anywhere as high as at present.

That the vigilance against the further introduction of virulent hog cholera from the Coast is still being guarded against will be seen from the appended letter from the federal live stock inspector in San Francisco, and which is self-explanatory. The fact should always be borne in mind that the virulence of the hog cholera microbe, like that of many other infectious and contagious diseases, varies so greatly in different localities that even if appearances justify the conclusion that a large percentage of the hogs here are immune to the infection *as it exists here*, there is no telling what degree of virulence they would be able to resist should a severe strain of infection accidentally be introduced. It is therefore reassuring to see the care with which our regulations are being enforced by the federal inspectors on the Coast, as testified to by Dr. Hicks' letter.

During the past month a hitherto unobserved and seemingly very serious condition was observed among the slaughtered cattle at the Hawaii Meat Company's slaughterhouse in Kalihi. The

condition consisted in a more or less pronounced oedematous (watery) swelling of the fatty tissue surrounding the kidneys, the lobes and lobules of fat being interspersed with sacks of crystal-clear fluid varying in size from a pea to a hen's egg or even larger. The kidneys themselves were somewhat enlarged, extremely pale, looking as if boiled. On section this condition appeared in the worst cases to extend throughout the entire organ, but were in others confined to the cortical substance only. The capsule was in all cases firmly attached to the organ, and no fluid was ever observed between them. The condition must therefore be diagnosed as acute nephritis and perinephritic oedema. No smell of urine could be detected even when considerable quantities of the fluid was collected and kept for one to three days, nor were any other lesions to be found anywhere else in the affected carcasses. These were, on the other hand, all in the best possible condition and were, in fact, the fattest prime steers ever seen here, and this very fact proved to be the solution of the problem. It should only be added that outside of the usual shipping soreness and stiffness, the animals in question showed no ante-mortem symptoms of any kind, but looked bright and ate well.

Acute nephritis, when not due to the presence of a specific infectious disease, such as anthrax, tuberculosis or hemorrhage septicemia, is generally caused by irritation of the kidneys in their effort to eliminate from the body toxic principles, whether generated in the body itself or introduced with poisonous plants, fermented food, young shoots of trees containing resin or tannin, but may be due to too highly nutritious food, rich in protein, such as cowpeas, vetches, clovers and other legumes. Cold also seems to be an important factor, especially cold driving rains, which are bound to accelerate the tendency to the development of nephritis if any of the previously mentioned irritating factors are present. In order to come to a definite conclusion a visit was made to the district where the cattle in question were shipped from. Especial attention was given to the fattening paddock out of which these animals had been selected, but, as already stated, none seemed to be otherwise but in perfect health and rolling fat. There had, however, been unusually heavy rainfall all through the spring months, with the result that feed was more than abundant, allowing the cattle to gorge themselves without moving any distance in search of food and, as it rained every day, they did not even have to go to the watering troughs, but simply ate water. The pasture in question was very rich in legumes, especially the sweet yellow clover and a variety of highly nutritious imported grasses.

This condition was exactly what was expected and accounted, in connection with the cold driving rains, fully for the affected kidneys as observed on the killing floor. The animals were simply so loaded up with the rich albuminous feed that their kid-

neys were overworked, the other means of excretion as promoted by exercise being excluded by the great abundance of feed.

The remedy was therefore simple enough—to remove the animals from the rich pasture for a week or so before shipping them to market, and to herd the remaining ones away from the richest parts of the pasture and let them work their way back for the sake of exercise.

It should be mentioned that the legumes only seem to have this irritating effect on the kidneys when only half or three-quarters ripe. As soon as they are fully ripe they no longer affect the animals, besides which they are less succulent and therefore less liable to cause gorging. Since the above recommendations were carried out no cases have been observed on the killing floor.

Bovine Tuberculosis Control.

As reports have reached this office about actually filthy milk—that is, milk with dirt in visible quantities on the bottom of the containers—it has been decided to make a thorough investigation of each individual dairy in the entire district and to prepare a report on the same.

At the same time a bacterial count is being made of samples of milk obtained from dairies in unsatisfactory sanitary condition, with a view to, if possible, submitting all the dairies to this most searching test.

The report of the assistant territorial veterinarian herewith appended shows the further progress in the elimination of the tuberculous cow from the local dairy herds, but, as he states, the time will soon arrive when more vigorous steps will have to be taken in order to make a complete clean-up, without which the disease will never be suppressed.

Respectfully submitted,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, June 30, 1914.

Dr. V. A. Norgaard, Chief of Division of Animal Industry.

Sir:—I have the honor to report as follows for the month of June, 1914:

Tuberculosis Control.

The following dairy stock have been tested during the past month:

	T.	P.	C.
F. Fugita	2	2	0
K. Shimidsu	1	1	0
T. Katsuko	5	5	0
F. de Mello	6	6	0
K. Okomoto	4	4	0
Ewa Boarding House	1	1	0
C. A. Vasconcellas	5	5	0
S. Mendonca	2	2	0
H. Dias	1	1	0
A. Ornellas	1	1	0
J. T. Ornellas.....	1	1	0
F. A. Ornellas.....	1	1	0
F. Dado	17	17	0
M. K. Young.....	1	1	0
W. E. Wall.....	17	16	1
A. W. Seabury.....	1	0	1
George Holt	29	25	4
A. F. Cooke.....	8	8	0
Kamehameha Schools	1	1	0

From the above tabulated list it will be seen that 104 head of dairy stock received injections of tuberculin, out of which number 98 passed and six were condemned and branded.

It is interesting to note that W. E. Wall's imported Holstein cow gave a reaction to this last test, this being the first time it has shown a reaction since it was condemned June 21, 1913, nearly a year ago, during which time she received three intradermal injections with apparently no result. On the first test, June 21, 1913, the sub-caudal fold was injected intradermally and the resulting swelling was clearly defined and typical of reactions in that part of the body. The day before I make my examination there had been a marked constitutional reaction which was observed by the owner. Since this time sub-caudal injections have been made at regular intervals with no results.

On the 10th of the month this cow was again subjected to the intradermal test, but after the improved method, i. e., injection into the skin of the lower eyelid, and this time she gave a distinct reaction. From the size and appearance of the swelling, which was smaller than the first reaction, our experience leads us to conclude that the disease had advanced to some degree and may even be generalized. The physical appearance of the animal, which has lost considerably in flesh, would seem to bear out such a supposition.

The cow condemned for A. W. Seabury was one of the Rose Davison dairy stock and the size and appearance of the reaction, together with the physical condition of the animal, would indicate that the disease is pretty well generalized.

George Holt's dairy has again shown a number of diseased animals. Only two months ago nine cows were condemned and branded out of a total of 27 head. This brings the total number of recently condemned animals from this dairy up to 13 head, all of which have been sent to Mr. Holt's ranch at Maili, where they can wander unrestrained and spread the infection all over the district. On a recent trip past Maili, three of these condemned animals were noticed grazing along the road. It would seem that the time is now at hand when this division should be given absolute authority and control over all condemned animals in order that they may be disposed of at once through the different slaughter-houses and not allowed to disseminate the disease throughout the island. It is our opinion that without such authority, control and eventual eradication of bovine tuberculosis within this Territory is practically impossible.

Importations of Live Stock.

June 1—S. S. Sierra, San Francisco: 17 crates poultry.

June 2—S. S. Lurline, San Francisco: 21 crates poultry; 2 dogs, Mrs. Kirkaldy; 4 crates poultry, Kahului, Maui.

June 9—S. S. Wilhelmina, San Francisco: 23 crates poultry; 1 dog, M. P. Morgan.

June 15—S. S. Ventura, San Francisco: 14 crates poultry.

June 16—S. S. Manoa, San Francisco: 35 crates poultry; 2 crates poultry, F. F. Baldwin, Kahului, Maui.

June 17—S. S. Georgian, Seattle: 205 butcher hogs, 28 hogs (breeding), 7 horses, 14 mules, 12 cows, 1 calf, 2 bulls, A. L. Macpherson.

June 23—S. S. Matsonia, San Francisco: 18 crates poultry, 1 crate swans, 1 crate pheasants, A. Robinson; 1 crate monkeys, W. F. X. Company; 1 monkey, Geo. Ahlborn.

June 23—S. S. Honolulan, Seattle: 1 Jersey bull (pure-bred), 1 Durham bull (pure-bred), S. M. Damon; 10 mules, 1 grade Durham bull, Schuman Carriage Company.

June 29—S. S. Manchuria, Orient: 1 dog, H. A. Hiscox.

June 20—S. S. Sierra, San Francisco: 3 crates poultry.

June 30—S. S. Lurline, San Francisco: 24 crates poultry

Respectfully submitted,

L. N. CASE,
Assistant Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

Honolulu, June 30, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen: I respectfully submit my report of the work performed by the division of entomology for the month of June, 1914, as follows:

During the month 35 vessels arrived at the port of Honolulu, of which 24 carried vegetable matter and one vessel molding sand.

Disposal.	Lots.	Parcels.
Passed as free from pests.....	1308	20,071
Fumigated	1	1
Burned	48	48
Returned	1	1
Total inspected	1358	20,121

Of these shipments, 19,892 packages arrived as freight, 112 packages as baggage of passengers and immigrants, and 117 packages by the U. S. mail.

RICE AND BEAN SHIPMENTS.

During the month 34,981 bags of rice and 3521 bags of beans arrived from Japan which were allowed to land after thorough inspection.

PESTS INTERCEPTED.

Twenty-nine packages of fruit and 15 packages of vegetables were found in the baggage of passengers and immigrants from foreign countries, all of which, being prohibited, were destroyed. One hundred and six boxes of apples from the Pacific Coast had to be overhauled on account of having been packed in moth-infested boxes, the fruit not showing any infestation. One box of plants from California was found infested with the common greenhouse whitefly and the plants were fumigated before delivery.

One package of plants arriving from Manila without a permit from the Federal Horticultural Board was returned to the shipper.

During the month two packages of medicinal worms arrived, one by parcel post, in which the worms were very much alive; in fact, one moth had almost emerged from the pupa. This shipment was identical with the one destroyed in the month of February, but no instructions accompanied the sending. The other package consisted of a tube made out of a joint of bamboo, sawed

into at one end, making a perfect mailing tube, and found in the baggage of a Japanese at the immigrant station. It contained 12 large lepidopterous larvae which we found had been baked; however, we confiscated the lot so as to discourage the worm-eating habit for the cure of consumption, thereby lessening future importations if possible.

BENEFICIAL INSECTS.

Dr. Silvestri sent six tin tubes containing dungfly material, but unfortunately the shipment arrived in very bad condition, all beetles being dead. Mr. Muir sent a box of soil containing larvae and pupae of the Japanese rose beetle, supposed to be parasitized. This box was examined at the Planters' station with Mr. Swezey present and, after removing all the larvae and pupae, the soil was fumigated and destroyed by burning.

The breeding and distribution of the various parasites from Silvestri has continued during the month. Owing to Mr. Bridwell's trip to Africa, this work now falls to me with one assistant. Our endeavor is to keep the parasites breeding until such time as we are positive that their establishment is a certainty. We have liberated 11,190 parasites during the month, and we are devoting our efforts especially to the distribution of the *Opius humilis*, which appears now to be the most promising. We have been able to rear this parasite from guavas and other fruits collected in the vicinity where the species was liberated a month or so ago. We have also been breeding the two Philippine parasites for hornfly and housefly which Mr. Fullaway brought with him on his return from the Philippines. About 1000 of each species have been liberated during the month.

HILO INSPECTION.

Brother M. Newell reports the arrival of nine steamers at the port of Hilo, six of which brought vegetable matter consisting of 142 lots and 2787 packages; all being free from pests, they were passed. On account of the usual ten days' retreat for Brother Newell, I sent Mr. D. B. Kuhns to Hilo to look after the work during that time.

INTER-ISLAND INSPECTION.

During the month of June 62 steamers plying between the islands were attended to and the following shipments were inspected and passed:

Plants	96	packages
Taro	660	bags
Fruit	28	packages
Vegetables	14	"
Awa root	2	"
<hr/>		
Total passed	800	

The following packages were refused shipment on account of being either infested with pests or having objectionable soil attached to plants:

Plants	7	packages
Fruit	6	"
Vegetables	2	"
<hr/>		
Total refused	15	"

Respectfully submitted,

E. M. EHRHORN,
Superintendent of Entomology.

DIVISION OF FORESTRY.

Honolulu, June 30, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I have the honor to submit as follows the routine report of the division of forestry for June, 1914:

FOREST RESERVE FENCING.

During the early part of the month, as one result of my visit to Kona in May, definite arrangements were completed with Messrs. F. R. Greenwell and John A. Maguire for the fencing of the Waiaha Spring forest reserve boundary in North Kona, and part of the material for doing the work forwarded. Arrangements were also consummated for the building of a forest fence on the land of Wailupe in Palolo Valley, Oahu, that will protect the forested ridge between Palolo and Manoa valleys.

Satisfactory reports have come in that progress is being made on the other forest reserve fences now under way.

FOREST LAND TRANSFER.

Under the date of June 13, 1914, a formal agreement was signed by the Governor and the Commissioner of Public Lands,

acting for the Territory, and by the Honorable George R. Carter, whereby the latter transfers to the Board of Agriculture and Forestry for a period of five years a tract of 132 acres of forest land, on the slopes of the mountain at the head of Manoa Valley, Honolulu, for forest purposes. The land forms a part of the Honolulu Watershed forest reserve. The object of turning the custody and control of it over to the government is that, along with the government land at the head of Manoa Valley, it may be cared for by the Territorial division of forestry in accordance with the principles of practical forestry. Under Chapter 28 of the Revised Laws of Hawaii the government may accept such transfers of lands, under conditions to be fixed by the board. As long as an area of forest remains exclusively in the control of the government, it is, upon demand, exempted from taxation. The amount of the taxes remitted on this Manoa land is not great, Mr. Carter's idea being rather to signify in a public manner his willingness to coöperate with the Board of Agriculture and Forestry and his belief in its forest work.

One other similar transfer has already been made in Hawaii. This was in November, 1906, when certain lands in the Koolau district on Maui, leased and owned by the Alexander & Baldwin interests, were turned over to the government for a term of seventeen years. The action of ex-Governor Carter in regard to his Manoa Valley land is of especial importance, as it helps to confirm and establish a precedent. In later years, when the Territorial government is equipped with an administrative force adequate to the task of properly caring for its forest reserves, the present transfer may be of assistance in helping to bring other owners of private forest lands into line.

ISSUE OF PERMITS.

At the end of June several permits, good for a period of three months, were renewed to persons temporarily occupying portions of the tract named Kalawahine, in the Honolulu Watershed forest reserve. In return for this privilege the licensees pay a fee to the government and agree to turn out to fight forest fires should any start in their neighborhood from any cause whatsoever.

TRIP TO MAUI.

From the 15th to the 27th of June I was on the Island of Maui, engaged in a general inspection trip that included several districts. Landing at Hana, I first visited and inspected the forest fence built for the board on the boundary of the Hana forest reserve above Nahiku. This fence, together with the sections of it built jointly by the board and the adjoining private owners, now shuts off and protects the native forest from Puu Hinai to Maka-

pepe Gulch to the north and west of which the forest is already protected voluntarily and under government lease requirements by the East Maui Ditch Company. The fencing above Nahiku was done for the government by the Nahiku Rubber Co. under the personal supervision of its manager, Mr. W. A. Anderson. It is a satisfactory piece of work.

Next, in company with Mr. R. A. Drummond, I worked along the forest line at the south end of the Hana district and across Kipahulu and Kaupo. The object of this portion of the trip was to determine the points between which forest fences are required, and in Kaupo and Kipahulu to lay out the boundary of a forest reserve. These two districts contain the one large section of government forest land in the Territory needed for stream protection that has not yet been brought into the forest reserve system. A report recommending the establishment of the Kipahulu forest reserve will shortly be submitted to the board for its approval.

Crossing Kahikinui, I then followed and inspected the recently-repaired fences around the Polipoli Spring section of the Kula forest reserve. I am glad to report that this fence, which for a considerable time had been in bad condition, is now in excellent shape, new posts having been set and the wires restrung. The upkeep of the Polipoli fence is required by the license to use a portion of the water from Polipoli Spring, held by Dr. J. H. Raymond.

While on the mountain I also rode the newly-constructed forest fence on the boundary of the Kula forest reserve, built under the requirements of government lease held by the Cornwell Ranch. This fence is substantially built of mamane posts, five wires. It runs from the corner of the Polipoli section across the face of Mt. Haleakala to the northern boundary of the government land of Waiakoa. Mauka of the fence the land is of such character as to be judged of but small value for grazing. It was accordingly set apart as a forest reserve with the expectation that in time it could be made to grow conifers and other temperate zone trees. It is to be hoped that steps to start such planting can be taken before very long.

In addition to the fence building the Cornwell Ranch is also under obligations to plant trees on the government grazing land it has under lease. The three plots so far started were visited by me and the planting examined. Eucalyptus are the trees used. The little trees are starting well, the percentage of loss in the planting being very small. Several additional plots will soon be put in to bring up to date the number of trees required to be planted.

On subsequent days I inspected the fence built for the board on the boundary of the Waihou Spring forest reserve near Olinda, under contract by the Haleakala Ranch Co.; had a look at the federal experimental tree lot No. 1, higher up Mt. Halea-

kala; visited the experimental tree-planting plots above Kailiili, Makawao, and, in company with the man now in charge there, went over the proposition of thinning out the algaroba forest on the government lands on the beach at Kihei.

The fence at Waihou is satisfactorily completed. In the mountain tree lot I found a dozen or more specimens each of three different pines and of incense cedar, firmly established and growing vigorously. Some of the pines were between 6 and 7 feet in height. In this plot are also various eucalyptus and other forest trees set out under the direction of this division during the past six years. Although meager in number, the success of these individual trees shows that it is feasible to grow such temperate zone species. Later, when it is found possible to undertake such experimental planting on Mt. Haleakala in a more systematic way, much benefit should result from it.

The experimental plantation of eucalyptus above Kailiili is in charge of Mr. W. Hannestad, under a coöperative arrangement with the Maui Agricultural Company. A considerable variety of species new to Hawaii have been planted here in the past two years, to be tried out. The results so far make this experiment a very satisfactory one.

REPORT FROM THE NURSERY.

Mr. Haughs' report for June, which as usual is transmitted herewith, gives the details of the section of the division of forestry's work dealing with tree planting and the distribution of seedlings. The item of especial interest this month is that a good stock of little trees is being got ready for the planting season, next autumn.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, June 30, 1914.

R. S. Hosmer, Esq., Superintendent of Forestry.

Dear Sir:—The following report gives the principal work done during the month of June:

Nursery.

Distribution of Plants.

	In Seed Boxes.	In Boxes Transplanted.	Pot Grown.	Total.
Sold	2,250	200	258	2,708
Gratis	13,000	3,948	1,263	18,211
	<hr/> 15,520	<hr/> 4,148	<hr/> 1,521	<hr/> 20,919

Collections.

Collections on account of plants sold amounted to.....	\$15.40
Rental of building, Nursery grounds, for month of May..	35.00
	<hr/>
Total.....	\$50.40

Plantation Companies and Other Corporations.

The distribution of plants under this heading amounted to 250 in seed boxes and 1300 in transplant boxes; total, 1550.

The propagation of large numbers of trees for the coming planting season is now going on and a big stock will be on hand. This work will keep all hands busy for some time to come.

Makiki Station.

At this station the new introductions are being tested and quite a number of very promising species are now almost ready to plant out.

Honolulu Watershed Planting.

The two men employed to hoe and care for the trees recently planted on Sugar Loaf and adjoining lands have been doing regular routine work along these lines.

Advice and Assistance.

The writer has been asked to make calls and give advice as follows:

Visits in and around the city, 6; advice asked by telephone, 8; advice asked at Nursery, 11; advice asked by letter to other islands, 4.

Respectfully submitted,

DAVID HAUGHS,
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

Honolulu, Hawaii, July 11, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the division of hydrography during June, 1914, is submitted:

OAHU.

While leeward Oahu has had a comparatively dry month, the Koolau range has received more than its usual amount of rainfall, with the result that reservoirs along the leeward side of the range are well filled.

In addition to routine field work, the construction work in connection with the coöperative stream-gaging stations was well advanced. One clock register stream-gaging station on the lower south fork of the Kāukōnahua and one relock register ditch-gaging station for the U. S. Army were completed, and two of the three clock register stream-gaging coöperative stations for the Kahuku Plantation Company on the main and middle branches of the Malaekahana stream were finished. It is expected that the remaining three coöperative stations for the Kahuku Plantation Co. and the Laie Plantation Co. will be completed during July.

KAUAI.

June was an unusually wet month, and the island generally received an abnormal amount of rainfall. On June 22 heavy rainfall was general all over the island, and the Wainiha river was reported by Mr. Menefoglio as the highest he had ever seen it.

A minimum amount of routine gaging work was done on account of the heavy construction work being accomplished. The Waioli stream (government water) clock register measurement station at an elevation of 750 feet above sea level was completed. This station necessitated the construction of a three-mile trail, which required the labor of four laborers and one foreman for a period of 22 days.

During July a clock register stream-measurement station will be constructed on the Wainiha river above the power line ditch intake, at an elevation of about 750 feet above the sea level. No trail work will be required for this station.

June 3 to 5: The superintendent made reconnaissance investigations of the Waioli and North Wailua valleys, and definite locations were selected for station sites.

MAUI.

Wet weather conditions continued during June, but there was less rainfall than during the previous month.

Twenty stream measurements were made during the month at medium or flood stages. Four new Stevens clock registers were placed at stations previously prepared to receive them.

The month was utilized almost entirely in obtaining stream measurements which improved rating curves.

HAWAII.

From June 17 to 22 an examination was made of the south branch of the Wailuku river near Hilo at the request of the Attorney General, in connection with the Hilo Boarding School ditch controversy. The results of this investigation have been reported to the Attorney General of Hawaii for his use when the case comes to trial at Hilo. Floods prevented the completion of this investigation, and a further examination will be made as soon as the Wailuku drops to a normal stage, probably during July.

EXPERIMENTAL INVESTIGATIONS.

Tentative arrangements have been made with the director of the H. S. P. A. Experimental Station to undertake an investigation of ditch losses, evaporation, water duty under different conditions of soils, etc. The work will be started at the experimental substation at Waipio near Waipahu, Oahu. The H. S. P. A. will furnish all labor, materials, etc., while this division will furnish the technical help to carry out the hydrometric work. After the work has been started at Waipio it is hoped that it can be extended to plantations on all islands under differing conditions of soil, climate, crops, etc.

The first work to be taken up will be the investigation of ditch seepage soil and distribution losses, and some evaporation experimental work which will be started during July.

It is believed that the data obtained will open the way to greater efficiency and economy in water utilization in Hawaii.

STREAM-GAGING STATIONS MAINTAINED.

Island.	May 31.	Established	Discontinued	June 30.
		During Month.	During Month.	
Kauai	27	1	0	28
Oahu	44	4*	0	48
Maui	43	2	2	43
Kona, Hawaii	1	0	0	1
Total	115	7	2	120

* Registers not yet put in.

Of the above stations, the following are clock register or continuous record stations: Kauai, 12; Oahu, 15; Maui, 20; Hawaii, 1. Total, 48.

Very respectfully,

G. K. LARRISON,
Superintendent.

ALFALFA—A PROMISING FORAGE CROP FOR HAWAII.

By WILLIAM H. MEINECKE, Class of 1913.

(Concluded.)

SUMMARY.

Alfalfa is not only an excellent fodder plant, but it is very good as a rotation crop with corn and sorghum. It will grow well on almost any soil provided it is well drained and free from acids.

The usual amount of seed sown broadcast is 20 to 30 pounds per acre, but 15 pounds of prime seed should be sufficient. If drilled, less seed is needed.

Weeds are first of all the worst enemies of the young alfalfa seedlings, but by judicious methods of preparing the land, their growth can be reduced to a minimum.

Cut worms are the worst and so far the only important enemies of the Hawaiian alfalfa crop, but they may be controlled by drowning and poisoning.

Weeds and cut worms are no longer troublesome after the crop has once become well established.

The field requires little care after the first few months and will continue to produce high yields of fodder once in three to five weeks, according to the variety and season.

While the cost of production for the first year is very high, subsequent crops which continue maturing every month for several years will more than make up for it and produce large profits.

Of the varieties under test at the College of Hawaii, the Utah strain of the Chilean proved to be by far the best, with the Kansas variety a good second.

The Arabian variety did not yield as well as the others, but it matures in from 17 to 21 days, and is very succulent and tender. Where there is ample moisture and a desire for frequent harvests, this variety will prove to be very desirable, especially for feeding hogs and chickens. On the other hand, this variety is very susceptible to a fungous root rot and it is not recommended where this disease is likely to be present.

One acre should produce eight to 10 tons of green fodder per

month at a cost of \$18 to \$20 per acre (including weighing) if harvested with the sickle. The use of the machine mower and horse cultivator will aid greatly in reducing the cost of production.

Every dairy should have alfalfa and corn or sorghum fields. These crops yield heavily at low cost and make very good mixtures for the silo and feeding ration.

Cows are especially fond of alfalfa, sorghum and corn, and judicious feeding will prevent them from getting "off feed."

Alfalfa has done well in all parts of the United States and in Hawaii.

The average annual yields of the common variety in the United States is three to five tons of dry hay per acre from three to five cuttings. In California the average annual yield is five tons of hay per acre from five to seven cuttings, though 10 to 12 tons have been obtained from nine cuttings on the best alfalfa lands.

Hawaii can produce an equivalent of 10 tons of dry hay per acre during the first year and still more than that during the second. Nine months from the time of seeding the College of Hawaii experimental plot (common Utah) has produced an equivalent of 26.10 tons green or 5.22 tons of hay from six cuttings.

Our last crop of the Utah strain yielded 9.24 tons of green fodder or 1.85 tons of dry hay per acre. Taking this as a basis, and allowing for 12 cuttings, one acre should and undoubtedly will produce in one year (second year's growth) 110.88 tons of green feed, or 22.20 tons of hay. Half this yield would be profitable.

CONCLUSION.

Alfalfa is an extremely difficult and expensive crop to establish, but owing to its long life and high yields and feeding value, it is in the end very profitable.

The discouragements which accompany the establishment of the crop are very trying, but success requires only a few months of persistence and a "never-say-die" spirit on the part of the grower.

This crop, together with corn—which has yielded as high as 94 bushels of grain per acre and an average of from 70 to 80 bushels at the College of Hawaii—is worthy of attention and trial by every stock feeder in the Territory.

W. H. MEINECKE.

May 31, 1913.

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A LITTLE-KNOWN FIG-TREE.

Familiar in Egypt under the ancient name of "Sycomore," the interesting species of *Ficus* known as *F. sycomorus* has for ages been renowned for its hard-wood and for its pleasant and nutritious fruit. This fruit, which the Arabs call "fig of Pharaoh," does not possess so fine a flavor as the figs of the species *Carica*, but it is nevertheless very agreeable to the taste, sweet, leaving an after-taste resembling that of coconut. The pulp is firm and juicy.

In Egypt, the "Sycomore" is not cultivated in orchards, but it is sometimes found growing in avenues. It forms a useful shade tree near to houses and particularly for wells to provide shade for the animals that work the native chain pump.

The geographical range of this species comprises Egypt, Abyssinia and Arabia. The tree is susceptible to cold weather. Mon. Charles Henry, ex-gardener-in-chief to the Khedive, writing in *L'Agronomie Coloniale* (October 31, 1913), believes that the tree would thrive throughout the tropics, particularly in sheltered localities. Specimens already exist in the French colonies in West Africa.

The propagation of *F. sycomorus* presents no difficulties and is done by means of cuttings 40 to 50 cm. long. In three years the branches are well formed and the young trees are ready to be planted out.

The flower of this species is different to the other representatives of the genus, for a description of which the reader may refer to Mon. Henry's article.

During each year after the tree has come in bearing, the bark of the larger branches is chipped off to quicken fructification. This treatment is analogous to "ringing."

The ripening of the fruit is stimulated by caprification—that is, by boring a small hole into the fruit. Latex is exuded and the wound heals. Ripening follows three or four days after caprification.

The average harvest yield is 660 lbs. of fruit per tree.

It should be pointed out that all "Sycomores" are not of equal value. Varieties exist but have not so far been determined; though by communicating with the writer mentioned above it would be no doubt possible for those interested in this useful tree to obtain further detailed information.—Agricultural News.

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The United States Geological Survey topographic map of Kauai is also on sale, and copies will be mailed on receipt of 50 cents.

The records and maps of this division are available for inspection by any one who desires information relative to water resources, topography, etc. Blue print copies of hydrographic data relative to any stream, ditch, spring, etc., which may be under observation by this division will be mailed free of charge on request.

This division will also make ditch seepage losses and utilization investigations when the actual cost of the labor, materials, subsistence, transportation, etc., of such investigations is paid by those benefited.

G. K. LARRISON,
Superintendent of Hydrography.

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All communications in regard to seed or trees should be addressed to David Haugs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

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To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent.

THE HAWAIIAN FORESTER AGRICULTURIST

VOL. XI.

SEPTEMBER, 1914.

No. 9

INEFFICIENT DAIRY INSPECTION.

If the municipal authorities fail in their duty to carry out the provisions of the milk ordinance which have to do with the cleanliness of dairies from which the public is supplied with milk, upon them will fall the responsibility not only of endangering the health and lives of the people—children in particular—but of preventing Honolulu from making the finest record of any municipal district in the world with respect to pure and wholesome milk supply. For, according to Dr. Nörsgaard's official reports, the testing of dairy cattle for tuberculosis has been more effectively accomplished, and that without compensation from the public treasury for cattle that had to be destroyed, in the City and County of Honolulu, comprising the island of Oahu, than in any other jurisdiction of which data has come to hand.

When the milk ordinance was passed, about five years ago, Dr. Nörsgaard, the Territorial veterinarian, with the sanction of the Board of Commissioners of Agriculture and Forestry, undertook to do the testing of cattle. This was to enable the dairymen to comply with the provision forbidding the sale of milk from tuberculous cows without having to pay professional fees for the service, besides being in accordance with the functions of the agricultural bureau relating to the suppression of diseases of livestock. This undertaking was begun under an arrangement between the committee on animal industry of the Board and the Board of Supervisors, whereby the latter gave money and the assistance of its sanitary inspectors to help the work. Very satisfactory results from this arrangement were achieved, as all who have followed the reports of the veterinarian know. Opponents of the milk ordinance at its inception, who insisted that without a compensation provision the measure would utterly fail, have been proved absolutely mistaken. Tuberculosis has been practically eradicated from the jurisdiction, and not one claim for compensation for hundreds of cattle destroyed has been recorded.

It is regrettable to find, in view of the achievement just mentioned, that the veterinarian is compelled to report failure with regard to the other prime object of the ordinance, that of enforcing sanitation in dairies, which is particularly in the province of the municipal government that enacted the measure. He shows in his July report, printed in this number, that the milk from

many dairies is heavily charged with dangerous bacteria. This is proof that the dairy inspection by the municipality is anything but efficient. It is a condition that the public should not stand for, endangering as it does the health and lives of young and old. The ignorance and prejudice that were hurled at the milk ordinance, before and after its first draft was vetoed by the mayor, are surely of the past since the veterinarian has published figures showing that it has tremendously reduced the number of cases and still more the number of deaths from tuberculosis among children under five years of age—cases by 66 per cent and deaths by 75 per cent, for the year ended June 30, 1913. Such a record must not be allowed to be spoiled by negligence on the part of the municipal inspectors relative to the cleanliness of dairies.

STANDARDIZATION.

With especial reference to cotton growing, the *Agricultural News* (W. I.) of August 15 devotes its leading article to "Commercial Standardization in Tropical Agriculture." The article mentions sugar as an article the valuation of which has been placed upon a scientific basis, saying that in the case of other crops, in spite of a similar need being experienced, little progress has as yet been made in the direction of standardization. The following opening paragraph of the article is worthy of attention by growers of all tropical products:

"In the production of every class of raw material that has to undergo manufacture before being sold to the consumer, it is very desirable, and indeed necessary, that scientific methods should be available for the precise determination or standardization of the so-called commercial grades. The introduction of a system having this object is particularly favorable to the interests of the producer or grower, for it assists him in forming a true judgment of the market value of consignments, and enables him to frame a definite idea of the class of material he should aim at producing. On the manufacturer's side, also, benefit accrues, from the fact that he is more likely to be supplied with the particular grade he is in need of, and this in uniform quantities."

It is gratifying to learn that the Territorial veterinarian has at last been able to enlist the county governments of the other islands than Oahu in the work of bovine tuberculosis control.

Dr. Nørgaard's zeal in guarding against the introduction of rabies to these islands will one day be appreciated. A single case of the awful malady slipping in would instantly silence all cavilling at the precautions, but in that event no doubt those who carp at the present restrictions would be first to blame the vet. for letting it happen. Such is human nature.

It is wonderful what a quantity of prohibited fruits and vegetables is attempted to be brought into these Islands every month. One should suppose that the foreign consuls would long ago have succeeded in making it generally known in their respective countries that these things are contraband except when accompanied by a Federal permit, and absolutely with respect to certain growths and certain countries of origin.

Any month's report of the division of entomology, with its record of pests intercepted, must create the conviction in the minds of all who read it that, were it not for the eternal vigilance exercised, tillage of the soil in Hawaii would be the most desperate form of human activity. It would be fighting an alliance of millions of foes.

Reports of fruit fly control by means of the parasites introduced by Dr. Silvestri from Africa seem to be more encouraging each successive month. The breeding of fresh contingents from the original distribution fields would indicate that these natural enemies of the pest have been locally established.

The report of the superintendent of forestry for July shows that the fencing of forest reserves is being done in a substantial manner. Anyone who has noticed the difference in forest growth between adjacent lands fenced and unfenced in these Islands will realize the importance of this branch of the work of the division of forestry.

Mr. Hosmer's encomiums passed upon the park creations at Kalahoe homesteads on Kauai ought to awake emulation on the part of homesteaders elsewhere.

A distribution of 13,692 tree plants to the general public in July, together with a total of 70,000 for the season to plantation and other corporations, shows that the forestation of bare spots in the islands is going ahead in magnificent style.

Superintendent Larrison's anticipation of "a large irrigation and power project which will serve leeward Kauai," as a result of the operations of the division of hydrography, will give an idea of the value of the work being done on all the islands by that branch of the bureau of agriculture. In time countless millions of gallons of water now wasting into the sea will be controlled for the purposes of agriculture, manufactures and the people's comfort. Honolulu, also, will shortly be informed of available resources now popularly unknown from which to supply its citizens with the additional water that the growth of the city will demand.

In this number will be found the proclamation of a new rule for the protection of the watersheds in Nuuanu and Makiki valleys, Honolulu.

Under the head, "Recent Progress in the Cultivation of the Sugar-Cane," the *Agricultural News* (W. I.) copies from the *International Sugar Journal* for July an abstract of the report of the committee on the cultivation and fertilization of unirrigated plantations presented at last meeting of the Hawaiian Sugar Planters' Association.

DIVISION OF ANIMAL INDUSTRY.

Honolulu, July 31, 1914.

The Board of Commissioners of Agriculture and Forestry.
Gentlemen:—

Bovine Tuberculosis and the Local Milk Supply.

As stated in my last monthly report the tuberculin testing of the dairy cows of the City and County of Honolulu will be resumed shortly or when the required tuberculin is received from Washington. The new improved eartags have already been received, a sufficient number having been secured to allow of their application to all tested cows in the entire Territory, and it is hoped that their use, in connection with the free supply of tuberculin and such services as the deputy Territorial veterinarians may be able to render, will add greatly to the extension of this important work to many districts on the other islands, where the eradication of bovine tuberculosis is still in its incipency. With the exception of Kauai, where the disease undoubtedly gained an early foothold with imported breeding stock, it is not expected that any such percentages of diseased animals will be met with as were encountered here at the beginning of the work. But unless supported financially by either the territorial or the respective local authorities the deputies cannot undertake a systematic eradication campaign such as was done here, but must apply themselves to it as opportunity and other duties will permit. As will be seen from the appended report covering the laboratory work done during the month of July the hygienic condition of the local dairy stables has not improved at the same rate as the sanitary condition of the dairy animals. With practically all diseased animals eliminated from the herds the bacterial count has in many cases increased instead of decreased, so what has been gained by removing the actual infectious disease germs from the market milk is frequently offset by the presence of disease producing filth germs by the million. This matter, however, will be dealt with in a separate paper now being prepared and until ready for publication it is recommended that the appended list of bacterial

counts be withheld in order to give the milk producers, some of whom work under disadvantageous conditions, an opportunity to improve their methods without first driving their customers away.

The Introduction of Non-Declared Dogs on Naval Vessels.

As will be seen from the appended correspondence and clippings attempts have again been made to bring dogs from rabies infected countries into the Territory in violation of the quarantine regulations. This applies in one case only to a dog on board the U. S. transport Thomas, while the U. S. S. Rainbow, direct from the Philippines, arrived with two dogs on board in violation of a strict federal regulation. These dogs could not even be landed here in quarantine, and were therefore destroyed. The U. S. S. Alert had on board four dogs, which are now all in quarantine, which also applies to one declared dog on board the U. S. transport Dix. Both the U. S. West Virginia and North Dakota had dogs on board while here recently, one of which at least was seen ashore.

So far as the transport service is concerned this office has been assured of the future strictest compliance with the local regulations, while the question of dogs being brought here from the Philippines on U. S. vessels has been referred to the proper authorities in Washington, D. C.

Cerebro Spinal Meningitis.

This disease has again made its appearance among the horses and mules on Maui and a letter is herewith appended from Dr. Fitzgerald, requesting my assistance in person. As a number of new theories as to dealing with this disease were advanced at the London International Veterinary Congress, the advance sheets of which have been received here, I would recommend that his request be complied with and that I be directed to visit Maui for the purpose of studying this disease as well as for the inauguration of a bovine tuberculosis campaign.

Very respectfully,

VICTOR A. NORGAARD,
Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

Honolulu, July 31, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the work performed by the Division of Entomology for the month of July, 1914, as follows:

During the month 37 vessels arrived at the port of Honolulu, of which 20 carried vegetable matter.

<i>Disposal</i>	<i>Lots</i>	<i>Parcels</i>
Passed as free from pests.....	1016	20,590
Fumigated	13	36
Burned	33	33
Returned	4	4
Total inspected	1066	20,663

Of these shipments 20,456 packages arrived as freight, 117 packages as baggage of passengers and immigrants and 90 packages by the U. S. mail.

Rice and Bean Shipments.

During the month 22,569 bags of rice and 2,434 bags of beans arrived from Japan and 20 mats of rice from China. All of these shipments were thoroughly inspected and were found free from pests.

Pests Intercepted.

Twenty-three packages of fruit and 6 packages of vegetables were found in the baggage of passengers and immigrants from foreign countries, all of which being prohibited were destroyed. Four packages of soil arrived by mail from Manila and were seized and the owner notified that soil is prohibited from entry here. This soil was sent here to be analyzed but the consignee did not care to forward the same to the Coast for this purpose, so it was burnt. Four packages of plants and seeds were returned to shippers in foreign countries as being prohibited in the mails under the rules and regulations of the Federal Horticultural Board. On an azalea plant from Japan were found a few flea beetles and the plant was fumigated before delivery. On a shipment of camellia plants from Japan we found some nymphs of a *Hemipteron* crawling on the cloth covering on board the steamer. We immediately had the packages placed in the fumigating room and treated with gas. After fumigation we found all crawling insects dead, among them being some caterpillars. Four boxes of Mexican limes arrived on the S. S. Lurline and as all Mexican fruit is contraband the boxes were seized and the consignee noti-

fied. As he did not care to return them to the shipper they have been burnt. A small lot of horse beans badly infested with the bean weevil (*Bruchus pisorum*) were destroyed.

Beneficial Insects.

Mr. Muir sent a box of soil containing the larvae and pupae of the Japanese rose beetle supposed to be parasitized. I opened the box in the presence of Mr. O. H. Swezey of the H. S. P. A. Mr. Swezey removed all the insects and turned all the soil over to me and it was taken to the garbage dump and burned. Mr. Swezey reports that none of the parasites have so far hatched and he has little hope for this sending, it having been too long on the way. Mr. Swezey also received a tube containing *Diptera* pupae from Mr. Muir, but unfortunately these also arrived dead.

Six lots of Japanese beetle fungus were distributed during the month. Dr. Silvestri sent nine tin tubes containing dungfly material. Only three tubes contained live beetles, fourteen in all, which were liberated in the same locality as the other sendings. This shipment left Italy June 14, arriving here July 3. All material contained in the tubes was fumigated and burnt so as to avoid accidental introduction of any plant germs or noxious insects. Considerable time has been devoted to parasite work. During the month 7,875 parasites were distributed on Oahu and the other islands. Of this number 2,475 were *Opis humilis* for the fruit fly and 2,000 were parasites for the hornfly; the rest were liberated in vegetable gardens for the melon fly. During the month we have been able to rear the three species of dungfly parasites from material gathered in the field. We have also obtained the *Opis* from several fruits gathered in localities about Oahu and from coffee gathered at Kona, Hawaii, we have reared 90 *Opis* from 100 fruitfly pupae. The parasite was first liberated in Kona about a year ago so that the *Opis* no doubt is established in that locality.

Hilo Inspection.

Brother M. Newell reports the arrival of seven steamers and one sailing vessel at the port of Hilo, five of which brought vegetable matter consisting of 215 lots and 2,443 packages. The plants in one box of shrubs had the soil removed before delivery. The steamer Anyo Maru arrived direct from Japan and brought 5,833-bags of rice and 195 bags of beans, all of which were found free from weevils and passed.

Inter-Island Inspection.

During the month of July 60 steamers plying between the islands were attended to and the following shipments were inspected and passed:

Plants	75	packages
Taro	721	"
Fruit	12	"
Vegetables	18	"

Total passed 826 "

The following packages were refused shipment on account of being either infested with pests or having objectionable soil attached to plants:

Plants	16	packages
Fruit	12	"
Vegetables	1	"

Total refused 29 "

Respectfully submitted,

E. M. EHRHORN,
Superintendent of Entomology.

DIVISION OF FORESTRY.

Honolulu, July 31, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I have the honor to submit the routine report of the Division of Forestry for July, 1914, and as usual to transmit herewith that of the forest nurseryman.

Forest Reserve Fences.

Another forest reserve project was got under way this month, the building of fences on either side of the government trail leading up to the Kolekole Pass in the Waianae hills, across the Lualualei forest reserve, Oahu. The contract was signed on July 15, with Mr. J. K. Luka of Waianae. Work on the fence is now in progress.

From July 16 to 19 I was on the Island of Kauai, primarily to inspect the forest fence across the government land of Wailua, mauka, above Lihue. This stretch of fence closes the gap between existing forest fences built and now maintained respectively by the Lihue Plantation and the Makee Sugar Company. The Wailua fence was built under contract by Mr. Kaina D. Lovell of Anahola, who did his work in a thoroughly satisfactory way. The fence has five wires and is built of redwood posts set 20 feet apart, with two northwest spreaders between.

In connection with the fences now being built on the boundary of the Waiaha Spring forest reserve in North Kona, Hawaii, ar

rangements have been completed for the erection of six of the Division of Forestry's metal forest reserve monuments at important corners.

During the last week of the month a final inspection was made of the forest fence on the mauka boundary of the Ninole homestead tract, Kau, Hawaii. The minor repairs and additions found necessary at the time of the first inspection having been made, and the fence now being in good condition, the job was accepted as completed.

Reconstruction of Forest Fences in Kau.

As the result of a special trip to Hawaii, July 25-31, I have here to report as follows on the condition of the fences on the boundaries of the Kau forest reserve. These fences, it will be recalled, were the subject of considerable discussion during 1912, between the board and the adjoining plantation companies, as the result of which the fences along the whole mountain section of this reserve, at both its east and west ends, have been or are about to be reconstructed. Under the requirements of government leases the Hawaiian Agricultural Company and the Hutchinson Sugar Plantation Company are under obligation to maintain the fences around the Kau forest reserve, but by mutual agreement with these companies, Mr. A. W. Carter, representing the Kahuku Ranch, has arranged to fence portions of the line along the Kahuku boundary. This boundary has recently been relocated by Mr. G. F. Wright. Most of the way along Kahuku the reconstructed fence is on the line determined by him.

The section of the Kau forest reserve fence built by the Hawaiian Agricultural Company runs from a point in Wood valley eastward through the government land of Kapapala, up through the forest on that land, and then westward to and along the Kahuku boundary, for a distance of something over five miles from the Kahuku-Kapapala corner.

Kahuku Ranch then has a section of about five and a half miles. This has not yet been built. Then comes the fence built by the Hutchinson Plantation, a stretch of approximately seven and a half miles, to the corner where the land of Kahuku turns makai. There is a stone wall down this line for two miles or so. The remainder of it is to be fenced by Kahuku Ranch.

Going first to Naalehu I inspected the section of the fence erected by the Hutchinson Plantation, on the mauka side of the forest. This fence is built of four wires, German make, No. 4, galvanized on iron. The posts are set 10 feet apart, of ohialehua, seven feet long, with a minimum diameter of 8 inches. Acting for the manager of the plantation, Mr. George Gibb, the actual construction of the fence was under the direction of Mr. Eric H. Edwards, manager of the Waiohinu Ranch. This fence is a satisfactory one in every way. It should give good service.

Under an arrangement with the owners of Kahuku Ranch,

Mr. W. H. Shipman has recently completed a clearing out of the wild stock on the mountain. Only a very few head of wild cattle are now left in the forest and these are being hunted by the adjoining ranchmen.

Around the east end of the reserve the fence of the Hawaiian Agricultural Company was entirely rebuilt during the year 1913. The former fence line was followed so that advantage could be taken of post holes blasted in the pahoe-hoe, but new posts were set throughout and new wire used. The total length of this fence is approximately 15 miles. The wire is of the best English make, galvanized No. 7. There are five strands in the fence. The posts, ohia-lehua or split koa, are set eight feet apart, and are almost without exception larger than the minimum diameter requirement of 8 inches. Wherever necessary the posts are guyed and braced. Especial care was taken across gulches and ravines to make the fence tight with extra wires. An excellent piece of work, this fence ought to be good for many years of effective service.

One more stretch of forest fence, across the Bishop Estate land of Punaluu, has also recently been completed by the Hawaiian Agricultural Company. This, with two lateral fences, respectively along the side of the Puu Enuhi ridge and adjoining the cane fields on Mohokea, completes the line of fences surrounding the east end of the Kau forest reserve. Between the regular forest fence and the cane field fences above Pahala, the entire east end of the reserve is now protected from the entrance of stock. All these forest fences were constructed under the personal supervision of Mr. Julian Monsarrat, who, for almost twenty years now, has efficiently carried out the wishes of the Hawaiian Agricultural Company in protecting this part of the Kau forest.

Reports and Statements.

During July I prepared for transmission to the Governor a statement of the work of the Division of Forestry for the past fiscal year, drew up a revised estimate of expenditures for the next six months, for the use of the commissioners; and wrote two reports recommending the creation of a forest reserve in the districts of Kipahulu and Kaupo, Maui, and of a so-called "forest park" along the Volcano road, Olaa, Hawaii. A public hearing to consider these projects has been set by Governor Pinkham for August 19, 1914.

The Planting on Kauai.

While on Kauai early in July, I visited the Papaholahola Spring reserve above Homestead, where, under the immediate direction of Mr. Walter D. McBryde, the Division of Forestry maintains a sub-nursery for the growing and local distribution of seedling trees, and an experimental ground for the trial of new species.

Conditions at the nursery were found to be very satisfactory. Through the recent improvement of the road the station has been made much more accessible. This should help to increase the number of plants that are annually given out. The blocks of trees in the area above the nursery are doing well. Provisional arrangements were made with Mr. McBryde for extending these plantations with other trees.

In this connection I wish officially to call attention to the tree planting by homesteaders and others in the vicinity of Homestead that has been going on in the last few years. Largely as a result in the first instance of Mr. McBryde's own efforts, the planting around Kalaheo has become general, so that now, looking mauka from Kukuilono hill, one sees a condition of shaded roads and tree surrounded homes equaled by no other place in the Territory. Kukuilono Park itself—the block of government land on the hill of that name which Mr. McBryde has beautified and thrown open to the free use of the public—has now become one of the attractions of Kauai. It is well worthy of being featured as an asset of the Garden Island that should not be overlooked.

Routine and Nursery Work.

As usual the staff of the Division of Forestry was kept busy during July with its regular routine work. The report of the forest nurseryman, transmitted herewith, gives the details of the plant growing and distribution.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, July 31, 1914.

R. S. Hosmer, Esq.,

Superintendent of Forestry.

Dear Sir:—I herewith submit a report of the principal work done during the month of July:

Nursery.

Distribution of Plants.

	In seed boxes	In boxes transplanted	Pot grown	Total
Sold . . . . .		....	274	274
Gratis	10,000	460	2232	12,692
Military Posts . . . . .	....	....	606	606
Schools . . . . .	....	....	120	120
	<hr/> 10,000 <hr/>	<hr/> 460 <hr/>	<hr/> 3232 <hr/>	<hr/> 13,692 <hr/>

Collections.

Collections on account of plants sold amounted to.....	\$ 6.20
Rent of building, nursery grounds.....	35.00
Total	<u>\$41.20</u>

Plantation Companies and Other Corporations.

The distribution of plants under this heading amounted to 500 in seed boxes and 168 pot grown. Total, 668.

We have received an order for 20,000 assorted tree seedlings to be delivered in September. Mention was made in a former report of receiving an order for 50,000 seedlings to be delivered before the end of the year, making 70,000 altogether for the coming planting season.

Makiki Station.

The work at this station has been principally the raising and transplanting of seedlings, attending to the new introductions and adding to our stock which we are getting ready for the coming Arbor Day and the general planting season.

Honolulu Watershed Planting.

The koa and kukui trees planted on and in the neighborhood of Sugar Loaf hill are doing very well. The two men are keeping them clear of weeds and grass and are also getting ready a stock of trees in case they should be required for additional planting in the near future.

Advice and Assistance.

The writer has answered inquiries and made visits as follows: By telephone, 6; by letter, 3; at nursery, 7; visits, 9.

Respectfully submitted,

DAVID HAUGHS,
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

Honolulu, Aug. 14, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the Division of Hydrography for July, 1914, is respectfully submitted:

Kauai.

Heavy rainfall on the uplands and on windward Kauai continued during the month. A rain gage maintained at a new station on the Lumahai stream at an elevation of about 700 feet above the sea level has recorded an average of an inch a day during the past two months.

Mr. Dort, assisted by Mr. Horner, completed a Stevens automatic clock register station on the Wainiha stream at an elevation of about 850 feet above sea level, and about one and one-half miles above the power canal intake. The construction of this station, which will record the entire flow of the stream, consumed the greater part of the month. This installation completes the construction work started nearly a year past in relation to the measurement of all large windward Kauai streams which, with the exception of the Wainiha stream, are practically all wasting into the sea. This group of streams is made up of the Wainiha, Lumahai, Waioli, Hanalei and Kalihiwai streams, with an estimated minimum discharge at the 750 feet level of about 260 million gallons per 24 hours. It is believed that in time, these waters will be diverted into a large irrigation and power project which will serve leeward Kauai. For topographical reasons it is believed that the water will be diverted at an elevation of about 700 feet and the measurement stations were all established above this level.

The installation of these stations has involved an immense amount of hardships and labor under the most adverse conditions to be found on the island. Many miles of foot trail have been constructed up the various valleys. All supplies to all but the Wainiha station had to be carried in on men's backs and the work was completed under disagreeable weather conditions. The stations are of a permanent type, and the records therefrom will prove of immense value to Kauai water users. Of the five streams, two, the Hanalei and Waioli, are owned by the Territory of Hawaii.

Oahu.

Seven coöperative clock register stations were established during the month. Five of these, which were constructed and established by Mr. Kimble, were Stevens automatic clock register stations for the Kahuku and Laie plantation companies on windward Oahu. These stations will measure the run-off of the Malaeka-

hana, Koloa, Wailele and Kahawainui streams. The remaining two were clock register stations established in coöperation with the U. S. Army on the lower south fork of the Kaukonahua, just above Wahiawa reservoir and on the Schofield Barracks water supply ditch, above the storage reservoir. These were constructed by Mr. Kimble in June, but the clock registers were not available until July.

Station sites were selected for weir stations in connection with the experimental work in relation to water duty for cane and ditch seepage losses which is to be taken up with the H. S. P. A. Experimental sub-station at Waipio.

Miscellaneous measurements taken on July 10 showed the total discharge of the Waiau springs near Waiau, Oahu, to be about eleven million gallons per day.

On July 23 a reconnaissance was made in the vicinity of Leilehua gulch with the superintendent of the Hawaii Preserving Co. at Wahiawa in connection with the possibility of drilling a well in that vicinity to investigate underground water conditions. The entire cost of this work will be borne by the coöperating company.

Mr. Kimble spent the entire month in the field on construction. Mr. Austin spent 17 days in the field on stream and rain gaging work, including nine days on Maui, and the remainder of the month in this office on computation and filing work.

Mr. Bailey spent from July 8 to 18th in the Honolulu office on Maui computation work.

Maui.

Maui enjoyed its fourth consecutive month of abnormally wet weather. Mr. Bailey spent 16 days in the field, during which time he visited 30 stream gaging stations, made 19 stream measurements at regular stations, including a number of flood measurements, and completed the construction of three foot bridges for flood measurements. During July 19 to 29th Mr. Austin accompanied Mr. Bailey and visited all clock register stations on Maui.

Hawaii.

On July 29 to 31 the undersigned accompanied the deputy attorney-general of the Territory of Hawaii to Kamuela, Hawaii, and made a number of stream and ditch measurements. These records with other data collected will probably be used as evidence in future litigation relative to the water rights of the Wai-koloa stream.

AUGUST PLANS.

Kauai.

The greater part of the month will be devoted to stream measurements. Should the coöperative parties be ready construction

work will be started on the two clock register coöperative stations on the Olokele stream and the new Anahola ditch. All equipment, materials, transportation and labor for the Olokele station will be furnished by the Hawaiian Sugar Co. All materials, transportation and labor will be furnished by the Makee Sugar Co. on the Anahola ditch station.

Oahu.

The coöperative experimental work for the H. S. P. A. at Waipio will be carried forward.

Further reconnaissance work in connection with the water resources of the Honolulu basin will be done.

A reconnaissance of the mountain waters of the Punaluu and Kaluanui valleys, above the 800-foot contour, will be made.

Mr. Kimble, who will probably be paid from territorial funds during August, has received permission to take 40 days' vacation leave, and will leave for Clear Lake, Iowa, on August 5. He expects to return about September 13.

Kauai.

Routine stream measurement work will be pushed, and a special ditch loss investigation for the Honolua Ranch Co. will be made.

Very respectfully,

G. K. LARRISON,
Superintendent of Hydrography.

CREATION OF TWO FOREST RESERVES.

Following a public hearing, Governor L. E. Pinkham on August 20, 1914, signed proclamations creating two new forest reserves, respectively on the islands of Maui and Hawaii.

The former, under the name "Kipahulu Forest Reserve," is situated in the districts of Kipahulu and Kaupo, and embraces all the forested area lying on the slopes of Mt. Haleakala above a line drawn approximately on the 2000-foot contour between the boundary of the old Hana district and the Kaupo gap. The area is 10,600 acres, of which 4600 acres belongs to the government. The remainder of the reserve consists of the great valley of Alae-nui, owned by the Kipahulu Sugar Co. The object of this reserve is to protect the streams, in view of their ultimate development for economic purposes.

The creation of the Kipahulu forest reserve practically rounds out and completes the first chapter in getting native Hawaiian forest under a proper system of administration and control. With the exception of two comparatively small areas on Oahu—Moku-leia and Hauula—all the forest land needed for the protection of

the watersheds of the important streams has now been technically set apart. A large percentage of the boundaries is fenced, and in most of the reserves trespass has now been reduced to small extent. But properly to care for the forest reserves, so that they shall render full service to the Territory, requires the organization of an efficient forest ranger service. This is the next step in forest work in Hawaii; the second chapter in making the native forests of the greatest value to all the people.

The other reserve, set apart on August 20, is called the "Olaa Forest Park," and consists of three blocks of Hawaiian forest along the Volcano road, near Glenwood, Olaa, Hawaii. The purpose of this forest park is to preserve, because of its scientific interest and scenic value, the only remaining tracts of native Hawaiian forest that are within easy reach of the tourist and visitor. The area of the Olaa forest park is 531 acres. It is set apart under the Board of Agriculture and Forestry largely for administrative reasons, being in the nature of a park rather than a forest reserve pure and simple, which is made primarily for economic reasons.

With these two new reserves, the total area of the 37 forest reserves now making up the Hawaiian forest reserve system is 798,214 acres. Of this, 546,222 acres (68 per cent) is land belonging to the Territory.

Following the usual custom, the reports of the superintendent of forestry on the Kipahulu forest reserve and the Olaa forest park are printed herewith, as are also the proclamations creating these reserves.

KIPAHULU FOREST RESERVE.

REPORT OF THE SUPERINTENDENT OF FORESTRY.

Honolulu, Hawaii, July 16, 1914.

Board of Commissioners of Agriculture and Forestry, Honolulu, Hawaii.

Gentlemen:—I have the honor to submit as follows a report recommending the creation of a forest reserve in the districts formerly known as Kipahulu and Kaupo, Island of Maui, now classed as a part of Hana. The area in question embraces all the lands mauka of a line drawn on approximately the 2000-foot contour, between the Hana-Kipahulu district line and the boundary of the fee simple land of Kakio, on the wet side of the Manowainui gulch, below the Kaupo gap into the crater of Mt. Haleakala. The area of the proposed reserve is approximately 10,600 acres. With the exception of the great valley of Alaenui, in Kipahulu, owned by the Kipahulu Sugar Company, practi-

cally all of the land included in the reserve belongs to the Territory.

The greater part of the proposed forest reserve is land very much cut up by gulches and ridges. It rises steeply from the strip of agricultural land near the sea. The upper portions of the lands included are on the ridges bounding the crater of Haleakala. It is all under a stand of native Hawaiian forest. I suggest that the reserve be called the Kipahulu Forest Reserve.

Object.

The object in creating this forest reserve is to provide for the better protection of a series of watersheds that potentially are of importance in the development of the Territory. A number of small valleys carrying streams having more or less permanent flow are included in the reserve, but essentially the important sources of water are the streams within the tributary to the Alae-nui and Manawainui gulches. Water from the former is now diverted and used on the Kipahulu Sugar Plantation. That in the latter gulch is not now used, except in a small way for taro patches in the valley. In both these gulches there appear to be great possibilities for the development of power. It may be a long cry ahead to the time when the water that goes over these particular falls will be harnessed, but in my judgment provision ought to be made now for giving adequate protection to the sources of the supply. The setting apart as a forest reserve of the government lands on which these streams rise is an essential step in that direction.

The creation of the Kipahulu forest reserve has been contemplated for a long time. My recommendation that it be established rests on several visits to Kaupo and Kipahulu, but particularly on one made in June, 1914, with this especial object in view. The creation of the Kipahulu forest reserve will round out the forest reserve system on Maui and practically complete the chain of forest reserves needed throughout the Territory.

Description.

On the east side of Kipahulu, from the Hana district line to and including the government land of Kikoo, the government lands are under lease to the Kipahulu Sugar Company under two leases, No. 488 (expiring March 6, 1915) and No. 522 (expiring December 20, 1919). The latter covers only the lower portion of the several lands included, leaving a balance of 809 acres, of the portion under forest, not under lease. The government lands on the western side of Kipahulu are not under lease. Across Kipahulu the boundary line of the proposed forest reserve runs at or a little mauka of the upper edge of the land that has been cleared

for cane. Some of the upper fields have been abandoned in late years, but it is believed that this line marks about the limit of profitable agriculture, even if with better times these upper lands are again brought under intensive cultivation. Further mauka, especially on the western side of Kipahulu, the topography is very broken, making the land unsuited for anything but forest.

In Kaupo is one good-sized private land, Kaapahu, the upper part of which would naturally fall within the limits of the forest reserve. But in that the owner of the land, Mr. R. A. Drummond, intends to continue to use it for grazing, it has been deemed best to leave Kaapahu out of the reserve. The boundary line therefore passes around this land. Kaapahu is bounded on both sides by deep and impassable gulches. The mauka boundary of this land will eventually have to be fenced, along with certain other land boundaries in both Kaupo and Kipahulu. When the present leases held by the Kipahulu Sugar Co. run out and come to be renewed, provision should be made for fences on the forest line where necessary. Fortunately, for a good part of the way natural barriers can be used.

The government land between Kaapahu and the Hanawainui gulch in Kaupo is the only section of the proposed reserve about including which in the reserve there is any question. This is a triangular area about 7000 feet broad at the base and running up steeply for an equal distance between large gulches, to a narrow neck near the hill Ahulili. Its makai boundary is now the mauka line of the Kaupo homesteads, laid out some ten years or more ago, and two or three private grants that stop at about the same elevation. The upper portion of this triangle is covered by a heavy stand of native forest, with ie-ie vines and other undergrowth. Lower down is a fairly uniform growth of young koa trees, 20 years or so old, apparently dating from a fire, with a scattering of larger koa trees. Along with the koa the waiawi (*Psidium pomiferum*) on this and adjoining lands is found spreading rapidly and making a better development than anywhere else in the Territory. It is here a valuable tree.

For some little way above the homestead boundary the forest is open and park-like in character, with a carpet of various forage grasses. There is no important source of water on this government land. The streams in the small gulches are only intermittent, the only spring of any consequence being one located way makai, not far above the government road, on private land. This area is not now under lease. It is, however, subject to grazing by cattle. At present not very many head are at large, but there is nothing to prevent more from being turned loose at any time.

It is my judgment that the mauka portion of this triangle ought to be reserved, but that the lower section, immediately mauka of the homestead, might properly be leased for grazing. I have accordingly asked the Survey Office to fix the boundary

between arbitrary points, there being no established marks on the ground. This line will eventually have to be run out and located on the ground, at which time it should be marked with forest reserve monuments. The section below the proposed forest line could then be leased, with a provision that a fence be built running across from the Kaapahu gulch to the Manawainui pali, thus making a barrier on the forest reserve boundary.

Before fencing can be done, a number of points will have to be located and marked on the ground all the way across Hana, Kipahulu and Kaupo. This is work for which provision ought to be made. The section of boundary just suggested could be run out at the same time.

The Manawainui gulch itself, with its subdivisions, is already a natural reserve, but being all government land it had best be included in the forest reserve. Above the waterfalls and stretching up to the edge of the crater is a section of government land that was formerly used for grazing but which has been abandoned of late because it was so rough and also because the more open places had become overgrown with the weed pamakani. There is said to be only one entrance to this section—across a hogback leading in from near the trail up the Kaupo gap, at about the 4000-foot elevation. This trail is now fenced off. In that all this upper section, above Manawainui, is the source of the streams that drop into that gulch—water which I believe sometime will be required for power development,—it is my judgment that it should be included in the reserve. From conversations had with Mr. Antone Vierra and other ranch men in Kaupo, I think that such action will meet with favor rather than opposition.

Boundary.

The lower boundary of the proposed Kipahulu forest reserve may roughly be described as follows:

Starting at the southwest corner of the Hana forest reserve, the line runs across at the heads of the private grants on Kauhakani and Papaulauana to the mauka boundary of Grant 3248; thence across Alaenui to the ridge of Palikea; thence at the head of the private grants on Kikoo and Maulili, across at approximately the elevation of the waterfalls in the main valleys to a point arbitrarily to be established on the eastern boundary of Kaapahu; thence around Kaapahu to a point on its western boundary approximately coinciding with latitude $20^{\circ} 40'$; thence across on this line to the pali of Manawainui gulch; thence into and across the gulch to include the government lands therein; thence up the boundary of Kakio to the Kaupo-Kipahulu district boundary; thence around and along the same to the point of beginning.

The official and technical description of the line is now being prepared by the Survey Office.

Recommendation.

For the reasons given above I do now recommend that the board approve the creation of the Kipahulu forest reserve and request the Governor of the Territory to hold the required hearings and thereafter to issue a proclamation setting the government lands apart.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

OLAA FOREST PARK.

REPORT OF THE SUPERINTENDENT OF FORESTRY.

Honolulu, Hawaii, July 15, 1914.

Board of Commissioners of Agriculture and Forestry, Honolulu.

Gentlemen:—I have to recommend as follows the creation of a small forest reserve in the Olaa section, Puna district, Hawaii, to be known as the "Olaa Forest Park Reserve."

The purpose of this project is to preserve for its beauty, its scenic interest and its scientific value the last remaining strip of the heavy native Hawaiian forest along the Volcano road, together with a grove of koa trees facing the road at 29 Miles. The former area consists of the untaken Olaa homestead lots bordering the Volcano road, mauka of Glenwood, between the twenty-three and the twenty-five-mile posts. It is the one place in the Territory where without effort or exertion the visitor to the Islands can still see the dense native forest in its primitive condition.

The Glenwood Forest.

The area proposed to be set apart consists essentially of lots Nos. 363, 364, 277 to 380, and 389 to 391 of the original Olaa Tract homestead subdivision, a total of 374 acres. All of these lots still vest in the government. The majority of them were never taken up. Those that were have since reverted to the Territory. All are covered with heavy forest, consisting of a stand made up principally of large ohialehua trees with a dense undergrowth of ferns, vines and shrubs. The lots named form a solid block across which runs the Volcano road. Adjoining this block are a number of privately-owned lots, on which the forest cover is of like character. It is the intention of the owners of these lots to continue to protect the forest on them. In effect this increases the size of the proposed reserve and insures the perpetuation of a block of forest large enough to maintain itself.

The government lots, especially those to the south of the road, are said to be extremely rocky, so that their value for agriculture would at best be but small. On the other hand the forest on these lots makes them, because of their location, of unique value to the Territory.

Ever since the Volcano road was first built, the Hawaiian forest along its course has been one of the most exploited features of the Island of Hawaii. With increasing attention to building up the tourist trade in the Territory it is strictly a business proposition to preserve and develop all places of special scenic attraction. From the tourist point of view the drive from Glenwood to the Volcano is a distinct asset.

"But this forest is not alone of interest from the superficial standpoint of the passing tourist. With the opening up of the surrounding country it will have increasing scientific interest from a botanical standpoint, while it may also well serve as a refuge for some of the remaining Hawaiian birds.

These being the objects of the reservation, it is to be regarded as a forest park rather than as a regular forest reserve. But for purposes of administration it can best be handled if set apart under the Board of Agriculture and Forestry.

"The second area proposed to be included in the reserve is located further up the road at 29 Miles, a small block of forest, of seven and a half acres, that I believe should also be reserved, say as Section B of the Olaa forest park. This is the stand of koa trees nearly opposite Mr. W. H. Shipman's mountain place, that was held out of the "Olaa Summer Lots" subdivision as a special "koa reserve." This koa grove is an interesting feature of the Volcano road. As the trees grow older it will be of interesting value as a part of the park.

Volcano Road Strips.

While this matter is under consideration by the board, I should like to bring forward one more suggestion which may result in increasing the area of the proposed forest park. I bring it up separately, as it involves a question of policy.

When the original Olaa tract was laid out, narrow strips of forest were reserved along the Volcano road between the twelve and the twenty-four-mile posts, with the idea of preserving the forest, just as is now proposed on a smaller scale. Unfortunately the strips were not made wide enough. When the land behind them was opened up many of the trees on the strips died. The result was that below about the eighteen-mile post the former "forest reserve" strips are now merely remnants of open land, which are now and for years have been subject to trespass; sources of annoyance to all concerned.

Mauka of the "Peck Road" at eighteen miles there is still a fair

stand of forest on some of the strips, increasing in density toward and above Glenwood. But even where the native trees have pretty much gone there exists here, should the board deem it wise to take advantage of it, good opportunity for the planting in their stead of introduced trees of suitable species.

At present the government probably has no funds that it would care to use for such work, but in time conditions may so change as to make such planting possible. For this reason it seems to me desirable that these remnants be added to and set apart as portions of the Olaa forest park.

The Board of Agriculture and Forestry has, of course, no authority or control over these strips, nor voice as to their disposition, other than as a matter of general government policy. As concerns those below eighteen miles, my personal recommendation as superintendent of forestry is that they no longer be held for forest purposes, but disposed of under the law, as the Department of Public Lands may see fit, as agricultural land. Below eighteen miles the original forest is gone. The strips there can in my judgment be used to better advantage for agriculture than for tree planting.

I believe it would be good business for the government to clean up in this way what is now an unsatisfactory land muddle.

For the reasons set forth I do therefore now recommend that the board approve the project of setting apart as the Olaa forest park reserve the three sections of government land above described, and that the board request the Governor to take the necessary steps to have the lands so set apart.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

BY AUTHORITY.

PROCLAMATION OF FOREST RESERVE IN THE DISTRICT OF
HANA, ISLAND AND COUNTY OF MAUI,
TERRITORY OF HAWAII.

Under and by virtue of the authority vested in me by the provisions of Chapter 28 of the Revised Laws of Hawaii, as amended by Act 65 of the Session Laws of 1905, and by Act 4 of the Session Laws of 1907, and of every other power me hereunto enabling, I, LUCIUS E. PINKHAM, Governor of Hawaii, with the approval of a majority of the Board of Commissioners of Agriculture and Forestry, having held the hearing of which notice has been duly given as in said Acts provided, do hereby recommend and approve as a forest reserve to be called the KIPAHULU FOREST RESERVE, those certain pieces of government and privately-owned land in the District of Hana, Island and County of Maui, Territory of Hawaii, which may be described roughly as embracing all the lands mauka of a line drawn on approximately the 2000-foot contour across the land districts of Maui formerly known as Kipahulu and Kaupo, between the Kaupo Gap and the boundary of the old Hana District, and containing an area of 10,600 acres, more or less, more particularly described by and on maps made by the government survey department of the Territory of Hawaii, which said maps are now on file in the said survey department marked Government Survey Reg. Map No. 1782, and "KIPAHULU FOREST RESERVE," and a description accompanying the same numbered CSF 2545, which said description now on file in said Survey Department is as follows:

KIPAHULU FOREST RESERVE.

District of Hana, Island of Hawaii.

Including portions of the Government lands of Kaumakani-Alaeiki, Kaka-hale-Kikoo, Kukuiaula, and Kaniaula, and of the privately-owned land of Alaenui.

C. S. F. No. 2545.

Beginning at the East corner of this Reserve and the South corner of the HANA FOREST RESERVE, said point of beginning being approximately 4348.5 feet North and 4310.2 feet East of Government Survey Trig. Station "Ahuula," as shown on Government Survey Registered Map No. 1782, and running by approximate true azimuths and distances:

1. 58° 30' 380 feet along Government land;
2. 53° 45' 2026 feet along Grant 3057 to Nakila and Company;
3. 63° 40' 2430 feet across Government land;
4. 57° 30' 330 feet along Grant 3248 to Kunukau;
5. 356° 30' 1700 feet across Alaenui to Trig. Station Ahuula;
6. 51° 00' 265 feet along Grant 2795 to Kaleimakalii;
7. 70° 00' 281 feet along Grant 2795 to Kaleimakalii;
8. 62° 30' 465 feet along Grant 2795 to Kaleimakalii;
9. 75° 20' 970 feet along Grant 1529 to Makaliku and Ihu;
10. 75° 20' 1000 feet along land of Maulili;
11. 70° 00' 3600 feet across Government land to East boundary of land of Kaapahu (L. C. A. 8559B to W. C. Lunalilo);
12. 156° 10' 9600 feet along said land to Kaapahu;
13. 83° 10' 5148 feet along said land of Kaapahu;
14. 330° 20' 4970 feet along said land of Kaapahu;
15. 90° 00' 6160 feet across Government land to center of Manawainui Gulch;
16. Thence along center of Manawainui Gulch, direct azimuth and distance being 16° 30' 4000 feet;
17. 95° 20' 500 feet across Government land and along land of Kumunui;
18. 18° 30' 1600 feet along land of Kumunui;
19. 10° 00' 160 feet;

20. 125° 10' 1725 feet along Grant 2134:1 to Loheama;
21. 4° 30' 600 feet along Grant 2134:1 to Loheama;
22. 355° 00' 200 feet along Grant 2134:1 to Loheama;
23. 87° 00' 780 feet along Grant 1449:2 to Kanakaokai;
24. Then along Grant 3457 to A. V. Marcial and along top of ridge on East boundary of Kakio to the North corner of Government land and West boundary of Alaenui, the direct azimuth and distance being 178° 15' 19,075 feet;
25. Thence along top of ridge to boundary point Palaha, the direct azimuth and distance being 162° 10' 6700 feet;
26. Then along boundary of Hana Forest Reserve to boundary point Kaumakani, direct azimuth and distance being 288° 30' 26,500 feet;
27. 330° 40' 10,350 feet along Hana Forest Reserve to the point of beginning.

Area, 10,600 acres.

And as provided by law, subject to the existing rights and leases, I do hereby SET APART as parts of the KIPAHULU FOREST RESERVE those portions of the government lands of Kaumakini-Alaiki, Kakahale-Kikoo, Kukuiula, Kaniaula, altogether an area of 4600 acres, more or less, that lie within the metes and bounds of the above described KIPAHULU FOREST RESERVE.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the Great Seal of the Territory of Hawaii to be affixed.

(Seal)

DONE at the Capitol in Honolulu, this 20th day of August, A. D. 1914.

LUCIUS E. PINKHAM,
Governor of Hawaii.

By the Governor:
WADE WARREN THAYER,
Secretary of Hawaii.

BY AUTHORITY.

PROCLAMATION OF FOREST RESERVE IN THE DISTRICT OF
PUNA, ISLAND AND COUNTY OF HAWAII,
TERRITORY OF HAWAII.

Under and by virtue of the authority vested in me by the provisions of Chapter 28 of the Revised Laws of Hawaii, as amended by Act 65 of the Session Laws of 1905, and by Act 4 of the Session Laws of 1907, and of every other power me hereunto enabling, I, LUCIUS E. PINKHAM, Governor of Hawaii, with the approval of a majority of the Board of Commissioners of Agriculture and Forestry, having held the hearing of which notice has been duly given as in said Acts provided, do hereby set apart as a forest reserve to be called the OLAA FOREST PARK RESERVE, those certain pieces of government land in the District of Puna, Island and County of Hawaii, Territory of Hawaii, which may be roughly described as the remaining area of government land along the Volcano Road under a stand of heavy Hawaiian forest, and containing an area of 531 acres, more or less, more particularly described by and on maps made by the government survey department of the Territory of Hawaii, which said maps are now on file in the said survey department marked Government Survey Reg. Maps Nos. 2250, 2411 and 2577 and "OLAA FOREST PARK RESERVE," Sections A, B, and C respectively, and descriptions accompanying the same in two parts numbered C. S. F. 2538 and 2544 (the description of Section C, the road strips, appearing directly on Map No.

2577), which said descriptions now on file in the said Survey Office are as follows:

OLAA FOREST PARK RESERVE.

Olaa, Puna, Hawaii.

SECTION A.

Including Lots 363, 364, 377, 378, 389, 390, 391 and portions of Lots 379 and 380, of the Olaa Reservation Lots.

C. S. F. No. 2538.

Beginning at the East corner of Lot 365 of the Olaa Reservation Lots (Grant 4345 to E. G. Hitchcock) at the junction of 30-foot side road with the Volcano Road, the coördinates of which point are 47,311.24 feet South and 37,490.65 feet West of Government Survey Trig. Station "Olaa," as shown on Government Survey Registered Map No. 2250, and running by true azimuths:

1. 304° 12' 2975.0 feet more or less across Volcano Road and along the Southwest side of a 30-foot road to a point in middle of old Volcano Road;
Thence along the land of Keaau along the middle of the old Volcano Road, the direct azimuths and distances being:
2. 55° 15' 2720.0 feet more or less;
3. 39° 20' 1477.0 feet more or less;
4. 63° 00' 930.0 feet more or less;
5. 124° 12' 4905.0 feet more or less along the Northeast side of a 30-foot side road, across the Volcano Road to the West corner of Lot 389 of the Olaa Reservation Lots;
6. 214° 12' 1200.0 feet along Lot 1 of the Brughelli Settlement Association Lots;
7. 304° 12' 561.0 feet along Right of Purchase Lease No. 155 to Mrs. B. Bergstrom (Olaa Reservation Lots);
8. 249° 45' 976.0 feet along Right of Purchase Lease No. 155 to Mrs. B. Bergstrom (Olaa Reservation Lots);
9. 304° 12' 2689.0 feet along Right of Purchase Lease No. 155 to Mrs. B. Bergstrom (Olaa Reservation Lots) to the Volcano Road;
10. 211° 49' 430.0 feet along the Northwest side of the Volcano Road to the North corner of the Volcano Road and a 30-foot side road;
11. 124° 12' 150.0 feet along the Northeast side of a 30-foot side road to the South corner of Grant 4547;
12. 211° 49' 601.0 feet along Grant 4547 to Mrs. J. C. McStay;
13. 304° 12' 150.0 feet along Grant 4547 to Mrs. J. C. McStay;
14. 211° 49' 400.0 feet along Grant 4547 to Mrs. J. C. McStay along the Northwest side of Volcano Road;
15. 124° 12' 150.0 feet along Grant 4547 to Mrs. J. C. McStay;
16. 211° 49' 200.0 feet along Grant 4547 to Mrs. J. C. McStay;
17. 124° 12' 309.0 feet along Grant 4547 to Mrs. J. C. McStay to the South corner of Grant 4345 to E. G. Hitchcock;
18. 214° 12' 801.0 feet along Grant 4345 to E. G. Hitchcock;
19. 304° 12' 213.0 feet along Grant 4345 to E. G. Hitchcock;
20. 211° 50' 400.0 feet along Grant 4345 to E. G. Hitchcock to the point of beginning.

Area, 380 acres, more or less.

Excepting and reserving therefrom that portion of the Volcano Road passing through this tract (area, 6 acres), leaving a net area of 374 acres, more or less.

SECTION B.

Being the Koa Grove Reservation in the Olaa Summer Lots Subdivision.

C. S. F. No. 2544.

Beginning at the West corner of the Volcano Road and Kalanikoa Road,

the coördinates of which point referred to Government Survey Trig. Station "Kulani" are 34,351.6 feet South and 20,278.6 feet East, as shown on Government Survey Registered Map No. 2411, and running by true azimuths:

1. 50° 98' 310.0 feet along new line of the Volcano Road;
 2. 33° 04' 245.8 feet along new line of the Volcano Road;
 3. 149° 31' 707.7 feet along the land of Keauhou to an ohia post;
 4. 239° 31' 525.9 feet along Lot 2, Block C, of the Olaa Summer Lots (Grant 5645 to Thos. E. Cook), to an ohia post;
 5. 329° 31' 547.6 feet along Kalanikoa Road to the point of beginning.
- Area, 7 32-100 acres.

AREAS.

Section A—374 acres,

Section B— 7.32 "

Section C—150 "

531.32 "

(Seal)

IN WITNESS WHEREOF, I have hereunto set my hand
and caused the Great Seal of the Territory of Hawaii
to be affixed.

DONE at the Capitol in Honolulu, this 20th day of
August, A. D. 1914.

LUCIUS E. PINKHAM,
Governor of Hawaii.

By the Governor:

WADE WARREN THAYER,
Secretary of Hawaii.

BY AUTHORITY.

RULE AND REGULATION OF THE BOARD OF COMMISSIONERS
OF AGRICULTURE AND FORESTRY, FORESTRY RULE NO. 1,
CONCERNING THE PROTECTION OF THE WATERSHEDS IN
NUUANU AND MAKIKI VALLEYS, HONOLULU, T. H.

The Board of Commissioners of Agriculture and Forestry of the Territory of Hawaii hereby makes the following Rule and Regulation for the purpose of protecting from contamination the watersheds tributary to the Honolulu water supply system, within the boundaries of the Honolulu Watershed Forest Reserve:

SECTION 1. All persons and corporations are hereby prohibited from cutting or removing grass and other forage plants except under such permits as may be issued from time to time by the Board of Commissioners of Agriculture and Forestry (1) from the government land in Nuuanu Valley, Honolulu, Oahu, lying within the boundaries of the Honolulu Watershed Forest Reserve, as established by a proclamation signed by Acting Governor E. A. Mott-Smith on October 13, 1913, which area, in part, includes the entire mauka portion of Nuuanu Valley above Laukaha; and (2) from all that portion of Makiki Valley lying mauka of the Makiki Dam, on the government land of Makiki (also included in the above-named forest reserve), as shown by registered map No. 2554, on file in the office of the government survey.

SEC. 2. Any person violating the above rule shall be guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine not to exceed Five Hundred Dollars (\$500.00), as provided by Section 390 of the Revised Laws as amended by Act 82 of the Session Laws of 1905, and Act 112 of the Session Laws of 1907.

SEC. 3. This rule shall take effect upon its approval by the Governor.
Approved:

(Sgd.) LUCIUS E. PINKHAM,
Governor of Hawaii.

Honolulu, Territory of Hawaii, August 22, 1914.

APPOINTMENT OF FIRE WARDEN.

Notice is hereby given that the Board of Commissioners of Agriculture and Forestry has appointed

L. A. MOORE

District Fire Warden in and for Nuuanu Valley, District of Honolulu, Oahu.

ALBERT WATERHOUSE,
Acting President and Executive Officer, Board
of Agriculture and Forestry.

Honolulu, T. H., September 5, 1914.

Notice is hereby given that the following appointments of District Fire Wardens on the Island of Maui have been made by the Board of Commissioners of Agriculture and Forestry:

WILBUR A. ANDERSON

in and for that portion of the District of Koolau, Maui, lying to the East of Makapipi Gulch,

W. F. POGUE

(modification of district) in and for the East half of the District of Hamakualoa and that portion of the District of Koolau lying to the West of Makapipi Gulch.

ALBERT WATERHOUSE,
Acting President and Executive Officer, Board
of Agriculture and Forestry.

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Board of Agriculture and Forestry

PUBLICATIONS FOR DISTRIBUTION.

The Board of Commissioners issues for general distribution to persons in the Territory, annual reports, bulletins, circulars, copies of its rules and regulations, and other occasional papers, which may be had, free, upon application.

A complete list of the publications of the Board available for distribution (together with the titles of certain issues now out of print) is to be found on the cover of the last biennial report.

Applications for publications should be addressed to the Mailing Clerk, P. O. Box 207, Honolulu, Hawaii.

DIVISION OF HYDROGRAPHY.

Rooms 20-22 Kapiolani Bldg. Tel. No. 3662.

The Division of Hydrography has on hand free publications relative to the water resources of the Hawaiian Islands. These publications furnish detailed data as to daily, monthly, mean, maximum, and minimum run-off of streams and ditches, and also cuts and maps pertaining to the different islands. Much descriptive data relative to the mountain ranges and physical configuration of each island are also contained. These publications will be mailed free of charge on request.

The United States Geological Survey topographic map of Kauai is also on sale, and copies will be mailed on receipt of 50 cents.

The records and maps of this division are available for inspection by any one who desires information relative to water resources, topography, etc. Blue print copies of hydrographic data relative to any stream, ditch, spring, etc., which may be under observation by this division will be mailed free of charge on request.

This division will also make ditch seepage losses and utilization investigations when the actual cost of the labor, materials, subsistence, transportation, etc., of such investigations is paid by those benefited.

G. K. LARRISON,
Superintendent of Hydrography.

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DIVISION OF FORESTRY.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

DAVID HAUGHS,
Acting Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications
**SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207,
HONOLULU, HAWAII.**

EDW. M. EHRHORN,
Superintendent.

THE HAWAIIAN FORESTER AGRICULTURIST

VOL. XI.

OCTOBER, 1914.

No. 10

PUBLICITY FOR PREVENTION.

In his report for August the Territorial veterinarian returns to the subject of inefficient dairy inspection and sanitary control, in terms that add force to the editorial remarks in the September number. That 228 dairy cattle, the first lot treated in the present annual test for tuberculosis on this island, refused to react is to Dr. Norgaard "a very promising beginning," but he adds to that view the statement that "it hardly justifies the anticipation of greatly improved total results when viewed in connection with the bacterial counts of 35 samples of milk" presented in his report but withheld from publication. He says that these counts "demonstrate beyond a doubt that a large percentage of the local dairies are disregarding even the simplest sanitary methods for the production of clean milk, and it is therefore not surprising that those dairies which have not yet succeeded in stamping out bovine tuberculosis, after four years' efforts, now find the disease on the increase."

With all the warning that has been given during several months past, in the reports of the Division of Animal Industry, time ought to be about ripe for inflicting on the delinquent dairy-men the penalty of publicity. Before the passage of the milk ordinance and the anti-tuberculosis campaign of the division mentioned, when the only efforts to ensure honest and clean milk for Honolulu consumers were those of the pure food branch of the Board of Health, there is no doubt that a large part of the battle, so far as it was successful, consisted in the regular publication in the newspapers of the detections and convictions of persons who sold milk that was diluted or below standard in nutritive contents. Why publicity should not be employed now against those who sell milk charged with noxious bacteria, due to unclean dairying methods, is a question that might well be taken under deliberation.

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- 1917

COMING KING COCONUT.

The following extracts from articles in the initial number of the *Tropical Mail* (London) ought to be of great interest in Hawaii, where the systematic cultivation of the coconut for commercial purposes has recently been started:

WORLD'S COCONUT PRODUCTION.

The matter which at the moment of writing engages our attention is the copious issue of books on the subject of the cultivation of the coconut. As happened in the earlier days of the rubber and other industries which have rapidly assumed exceptional importance, a number of books and pamphlets are being published upon the subject of coconuts, and many articles are now appearing thereon in the public press—all of which are “signs of the times,” and are the usual forerunners and customary indicators of great activity.

These books and articles no doubt serve a useful purpose. Some of them are excellent and accurate, and from all there is to be obtained some information of value. On the other hand, we have seen statements therein which show their authors somewhat too ready to compile statistics of the world's production and European consumption, which cannot be supported by adequate evidence.

For instance, in one article the statement appeared that the world's exports of copra in 1913 amounted in value to £75,000,000 sterling, and that this did not represent a quarter of the total value of coconuts used, or, in other words, that the value of the world's coconut output exceeded £300,000,000 sterling per annum.

In another instance there is an estimate that the value of copra coming into Europe alone now represents some £60,000,000 sterling per annum.

Such extravagant estimates are misleading and to be deprecated; there is nothing to justify them. Accurate statistics as to the value of the world's production of coconuts are not available, nor are they very likely to be so for a long time, if ever.

Only very incomplete figures are available as to the production of copra, coconut oil and desiccated, but an estimate, not entirely unreasonable, formed upon these figures, leads us to put the coconut production of the world at something in the neighborhood of 6,500,000,000 nuts per annum.

Now, if we reckon 5000 nuts to go to a ton of copra, this represents 1,300,000 tons of copra, which at £30 per ton are worth £39,000,000. In addition to the copra, there are, however, to be reckoned the coconut fiber—a valuable item—and also cattle food cake and other important by products. If the value of these

is added to that of the copra, the world's coconut production may reasonably be estimated at perhaps £50,000,000 per annum.

Whilst the world's population continues to increase, and whilst communities continue to advance towards what we have termed a "higher plane of living," the demand for and consumption of the coconut in the form of edible and industrial fats, fibers, yarns, and the many other articles, must continue to increase. There can be no limitation—the coconut is a necessity and not a luxury.

IMPORTANCE OF COCONUTS.

Perhaps the most important of many almost equally important products of the tropics is the coconut, the foundation and support of a score of great industries.

Though the consumption of coconuts has for many years been very large—and it must be noted that they form the principal food of the native populations of many of the countries in which they are grown—it has remained for recent scientific research to demonstrate the value of their products in the food and manufactures of civilized communities, and to show in what manner they may be utilized.

A mere enumeration of some of the principal of these uses and the manufactures which they support is sufficient to show how largely coconut properties enter into the every day life of the community.

Coconut butter (margarine), lard, desiccated coconut (biscuits, confections, cakes, sweets), cooking and burning oil, soap, candles, mats, matting, ropes, yarns, mattresses, cattle-food-cake, stuffing for furniture, imitation horsehair, brooms, brushes, etc.

SHORTAGE OF ANIMAL FATS.

Food must necessarily rank first in any list of articles, and among foods fat is one of the essentials for support of the human system. Hitherto the demand for this has been met by animal fats, the chief supply of which has been imported from foreign countries—the United States, etc. Of late years, however, a shortage in this supply has been manifested. This shortage is due not only to a diminution in the number of animals, but also to the fact that the countries hitherto exporting a surplus of their animal fats have so largely increased in population that they need all they can raise for their own consumption. The consequence is a serious shortage in this essential food, which is increasing and must continue to increase.

This deficiency in animal fat is filled by coconut butter, pure, scientifically prepared and free from all contamination, which we know under the name of margarine. How great a blessing mar-

garine has been to the working classes is known only by those who have mixed with them.

The housewife who has a large family to feed, and whose weekly allowance will not permit her to think of buying butter at 1s. 4d. to 1s. 6d. per lb., must yet give the children something wholesome and pure to eat; and plenty of it. If only she had an opportunity of expressing her views in this column, she would say that the greatest boon which has come to this class of the community, during the last few years, is the manufacture of coconut butter, the backbone of which is pure coconut fat.

SOME QUESTIONS ANSWERED.

Se much we have said on the subject of the commercial value of coconut products. We will now consider questions which will naturally occur to any prospective planter or investor in plantations. These probably would be:

1. What is the cost of producing 1000 coconuts?
2. What is the market price of coconuts today?
3. How many years will the coconut palm continue to yield its crop?

The answers are as follows:

No. 1. The cost of producing 1000 coconuts, on a good estate, according to reliable figures, is 25s. to 30s., varying according to local conditions. This figure includes management of the estate, and expenses of every kind.

No. 2. A fair average price, whether converted into coconut oil, desiccated coconut, or copra; or whether the nut is sold in the flesh form, is from 90s. to 125s. per 1000.

No. 3. Well-attended palms will continue to produce, on well-kept estates, for upwards of fifty years.

It is therefore easy to see that there is a net annual profit, to the owner of the plantation, of over £3 per 1000 nuts; and that the various tropical countries are taking back from the world's buyers profits in hard cash, amounting to almost £20,000,000 sterling a year.

FOOD FOR THOUGHT.

These profits furnish, without doubt, food for thought to any commercial mind of the 20th century, for, in passing, it should be noted that even in 1903-4, when the market price of coconuts was only from £2 10s. to £3 10s. per 1000 and coconut oils stood at £22 and £24 per ton, the far-seeing man, whose brain was quick enough to observe the signs of the times, gave the advice, "Invest in coconut plantations; it is a sound and good investment."

Unfortunately for many, his advice was disregarded, but today

coconuts are difficult to obtain in quantities, even at the advanced price of £5 to £5 10s. per 1000, and coconut oil has risen to somewhere in the neighborhood of £45 per ton. If in ten years science has enhanced the value of this product to an extent that seems almost incredible, it is the firm belief of farsighted men that it will do so again—and in a less space of time. Scientific investigation is keener every year, and what it accomplished between 1904 and 1914 it will do again between 1914 and 1924.

INDUSTRIES OF THE TROPICAL WORLD.

The man in the street thinks of coconuts as having no better use than being placed upon wooden pegs, at bank holiday time, for the children to knock down. It may surprise him to learn that the coconut show business in the British Isles absorbs only about $4\frac{1}{2}$ millions of coconuts, value £32,000 sterling per annum, which is a small fractional part of the turnover of £50,000,000 per annum. It may therefore with justification be said that the minds of the public require some enlightenment on the subject of this industry.

USES OF SUGAR.

Sugar and molasses are said to be used in the shoe-blackening industry to a considerable extent. Soap-making finds a use for sugar in the place of glycerine. Copying ink is made of one part of sugar added to three parts of ordinary ink. * * * The walls built in this island some two centuries ago are said to have been built with some molasses put into the mortar. Even in the tanning industry and in silvering of glass mirrors, they say sugar is used. We would urge scientists to go forward and find some more uses for our staple commodity in this progressive age.—*Barbados Agricultural Reporter*.

Experiments are being made in Honolulu with molasses as a binder of broken coral in road construction, oil having been proved unsuitable for mixing with coral, although the right thing for binding other macadamizing material.

Dr. Norgaard's technical discussions of diseases of live stock—as, for instance, what he says about a horse distemper on Maui in his August report—ought to be preserved by stock raisers and owners for reference and guidance. When, as in the case mentioned, such a simple thing as the providing of pure water for stock saves the lives of valuable animals, the proverb about the “ounce of prevention” acquires great force.

Importations of thoroughbred livestock of various kinds, which appear in almost every month's report of the Division of Animal

Industry, form one tangible index to progress in the agricultural enterprises of these Islands.

It is gratifying to note the apparent success being met in establishing in Hawaii both the African and the Australian parasites of various noxious flies which were introduced last year by Dr. Silvestri, the Italian scientist. There is considerable promise on the horizon that control of such pests by natural methods will prove more than a dream of enthusiasts. The results of the present expedition of Messrs. Fullaway and Bridwell, in Dr. Silvestri's tracks, will be patiently but eagerly awaited.

Mr. Ehrhorn's flanking tactics against plant pests beat anything in the war news, and the best of it is that his reports from the battle front are incontestable. He can show his dead, either in ashes or in the vials of his museum.

Mr. Hosmer has left the superintendency of forestry in Hawaii with the proud record of having established 37 forest reserves with an area of 798,214 acres, of which 546,222 acres, or 68 per cent, are government land. This Territory lacks mineral wealth, other than limestone, but the day is coming when it can derive revenue for maintaining public services from its forests, as well as from the conservation of water which the forests aid.

More than 2000 tree plants distributed in August is keeping up the record of forest wealth creation by the Division of Forestry.

An item in the report of Superintendent Larrison for August, which is proof in advance that the Division of Hydrography stands to be classed as a reproductive government enterprise, is the promise of a readjustment of charges in water leases. The Territory will be paid for value received by the lessees, and there will be equality of treatment which will tend to make those who may have to pay higher rates than the present ones contented.

DIVISION OF ANIMAL INDUSTRY.

Honolulu, August 31, 1914.

The President and Members of the Board of Agriculture and Forestry.

Gentlemen:—I beg to report on the work of the Division of Animal Industry for the month of August, 1914, as follows:

BOVINE TUBERCULOSIS ERADICATION.

As will be seen from the appended report of the Assistant Territorial Veterinarian, a new general test has been begun, a

total of 228 dairy cattle being injected without a single reaction occurring. Though this is a very promising beginning, it hardly justifies the anticipation of greatly improved total results when viewed in connection with the bacterial counts of 35 samples of milk as herewith presented. These counts demonstrate beyond a doubt that a large percentage of the local dairies are disregarding even the simplest sanitary methods for the production of clean milk, and it is therefore not surprising that those dairies which have not yet succeeded in stamping out bovine tuberculosis, after four years' efforts, now find the disease on the increase.

In regard to the extension of the bovine tuberculosis control work to the other islands, I am pleased to state that during a recent visit to Maui I found the public disposition in regard thereto greatly improved, many milk producers having read with interest the published accounts of what has been accomplished on Oahu, and signifying their willingness to have their herds tested and to eliminate all diseased animals. The Maui deputy territorial veterinarian has therefore been supplied with 2000 doses of tuberculin and the same number of aluminum eartags, and will now pursue this work as fast as his time and opportunities will allow him. In the meantime 10,000 additional doses of tuberculin have been requisitioned from the Federal laboratories in Washington, and while notice has been received of the shipment of the same, it has not yet arrived, but will, upon receipt, be distributed in adequate quantities to the deputies on Hawaii and Kauai so that any milk producer in the Territory who so desires can have his herd tested and join the ranks of those who are helping to save human lives by furnishing non-infectious milk for the infants and children of these islands.

Appended to this report will be found a letter from the Chief of the U. S. Bureau of Animal Industry, pertaining to the bovine tuberculosis eradication work in the District of Columbia, with comments upon our work and methods here. Though the Federal authorities, with their unlimited means and facilities, have been engaged at this work for a slightly longer period than we, and though they are paying an indemnity of nearly 75% of the appraised value of all reactors destroyed, they have not yet succeeded in completely eradicating the disease, their last official record being 1.83 per cent of tuberculous cattle for the year ending June 30, 1913.

CEREBRO-SPINAL MENINGITIS IN HORSE STOCK.

During the latter part of August what threatened to be a severe outbreak of this disease was reported from Maui, and the writer, pursuant to the Board's instructions, proceeded to that island on August 31. Upon arrival it was found that six animals had died on one plantation, while one which was found in

a dying condition was destroyed for postmortem examination. The result of the latter was, as usual, negative in so far as actual pathological changes were concerned except for the presence of a number of aneurisms on the abdominal arteries, in which were found embedded the empyros of the armed wire worm (*Strongylus armatus*). The mature worm was also found in large numbers in the colon and cecum, but no trace of embryos or infarcts caused by these could be found in the brain. These intestinal and blood parasites play, in the writer's opinion, an important role as a direct, or at least a contributing cause to the appearance of that greatly-varying and complex series of symptoms in horses and mules which is most frequently referred to as cerebro-spinal meningitis, though admittedly a misnomer. As part of the life cycle of this parasite is spent in stagnant water, my efforts to prevent the repeated outbreaks of this disease have been principally directed toward the purification of the water supply on premises where the disease occurs regularly, and in a number of cases apparent success in suppressing the disease has resulted. The first rule is therefore to keep all horse stock away from stagnant water and especially to drain all water holes in the Sunday rest pastures where nearly all plantation draft animals are kept from Saturday afternoon till Sunday evening. When once infected such pastures are, however, not easily purified again, and when partly inundated by persistent rains the parasites are frequently carried to distant localities, where new centers of infection become established and a varying number of animals become infected and die. The disease is therefore always at its worst during the rainy season, making its first appearance from one to two weeks after the rains set in. In stables and yards where the water supply can be absolutely controlled much can be accomplished by filtering the water as it comes from the pipes or by said filters placed on open flumes. Medical treatment is of no use, as the embryos in the blood vessels cannot be reached by any form of medication now known to science, and our efforts must therefore be confined to prevention along the lines above indicated.

It is, however, encouraging to note that, even though it continued to rain nearly every day during the two weeks I remained on Maui, only one additional case came under observation, which fact would seem to indicate a decided diminution in the extent of the infection, possibly the direct result of preventive measures carried out during previous outbreaks or perhaps of unusual heavy downpours having washed most of the parasites to sea.

IMPORTATIONS OF STOCK FROM NEW ZEALAND.

After considerable effort permission has finally been obtained from the Secretary of Agriculture for the Parker Ranch to im-

port a number of very fine Merino rams from New Zealand via Sydney, Australia. Neither cattle nor sheep are allowed to enter the United States from any part of Australia, and as it has been practically impossible to obtain transportation for live stock from New Zealand to this Territory direct all importations from the Colonies have hitherto been barred. The Federal Department of Agriculture has, however, finally agreed to admit this shipment of fifty rams, transshipment at Sydney to be made under the supervision of the American consul at that place, the animals to be disinfected and quarantined upon arrival here. The correspondence on the subject will be found appended hereto.

ARRIVAL OF DOGS ON WARSHIPS AND TRANSPORTS.

This subject, which was discussed at length in my report for last month, is supplemented herewith by copies of the correspondence pertaining thereto. An unusually large number of dogs have arrived of late, not less than ten head during the month of August, of which number eight came on naval vessels or transports. Two of these arrived on the U. S. S. Rainbow, direct from the Philippines, in direct violation of the Federal regulations on the subject. These animals were destroyed by gas and the matter reported to Washington.

Very respectfully,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, August 31, 1914.

Dr. V. A. Norgaard, Chief of Division of Animal Industry.

Sir:—I beg to submit the following report for the month of August, 1914:

Tuberculosis Control.

The following dairy cattle have been tested during the past month:

	T.	P.	C.
Dr. Hansen	6	6	0
Waialae Dairy	1	1	0
Mr. Hopper	3	3	0
P. M. Pond	124	124	0
J. A. Templeton	94	94	0

From the above tabulated list it will be seen that 228 head of dairy cattle have been tested and all passed as free from tuberculosis.

Importations of Live Stock.

August 4—Wilhelmina, San Francisco: 1 dog (collie), Dr. H. F. Hollman; 3 crates poultry.

August 5—Shinyo Maru, Orient: 1 crate mandarin ducks, S. Sheba; 2 crates Japanese games.

August 10—Enterprise, San Francisco: 4 hogs (Tamworth), College of Hawaii; 1 horse, Mr. Ogg, Hilo, Hawaii.

August 10—Manoa, San Francisco: 3 crates poultry, Mrs. F. F. Baldwin, Maui; 1 crate poultry, A. White, Maui.

August 17—Chansler, Monterey, Cal.: 3 rabbits, Mr. Henderson.

August 18—Matsonia, San Francisco: 4 crates poultry.

August 20—U. S. A. transport Dix, Seattle: 397 horses, Quartermaster's Dept.; 1 dog, taken into quarantine while the Dix remained in port.

August 24—Sierra, San Francisco: 1 dog (Airedale), N. G. McCleare; 1 crate pigeons, W. F. X Co.

August 17—Hilonian, Seattle: 275 butcher hogs, A. L. Macpherson; 2 cows (Ayreshire), Cooke Ranch, Molokai; 1 bull.

August 17—U. S. S. Alert, San Francisco: 4 dogs, officers on board.

August 25—Lurline, San Francisco: 1 Holstein bull, 2 Holstein cows, College of Hawaii; 8 crates poultry, Sing Sing Co.

August 12—U. S. A. transport Thomas, San Francisco: 1 dog, Capt. Sibley.

Respectfully submitted,

L. N. CASE,
Assistant Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

Honolulu, August 31, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the work performed by the Division of Entomology for the month of August, 1914, as follows:

During the month 37 vessels arrived at the port of Honolulu, of which 18 carried vegetable matter and one vessel sand.

Disposal.	Lots.	Parcels.
Passed as free from pests.....	1099	23,100
Fumigated	2	101
Burned	30	52
Returned	1	1
Total inspected	1132	23,254

Of these shipments 23,065 packages arrived as freight, 132 packages as baggage of passengers and immigrants, and 57 packages by the U. S. mail.

RICE AND BRAN SHIPMENTS.

During the month 31,397 bags of Japanese rice, 5 bags of Chinese rice and 2071 bags of Japanese beans arrived at the port. All of these shipments were carefully examined and were found free from pests.

PESTS INTERCEPTED.

Twenty-five packages of fruit and two packages of vegetables were found in the baggage of passengers and immigrants from foreign countries, all of which were destroyed as contraband. One hundred bags of corn from Manchuria were found infested with the common rice weevil and were fumigated with carbon bisulphide before delivery. Forty-two crates of California peaches were seized and destroyed, as they were badly infested with the larvae of the peach moth. One package of plants from New York was found infested with the citrus mealybug and was fumigated before delivery. Three baskets of sweet potatoes from China were infested with the sweet potato weevil and sweet potato moth and were destroyed by burning. A package of taro from the Philippines came through the mail and was returned to the shipper under the ruling of the Federal horticultural law.

BENEFICIAL INSECTS.

During the month 4200 parasites were liberated in various places. They consist of 1000 *Opius humilis* for the Mediterranean fruit fly, 2000 were the three species of hornfly parasites and 1200 were parasites of the pupa of the fruit fly and were liberated in a cucumber field to ascertain if they will attack the pupae of the melon fly. On August 11 I received three samples of ripe coffee berries from the Kona district, Hawaii, for the purpose of ascertaining how far the *Opius* parasite has spread. These samples were from Kaawaloa, Kealakekua, Kiloa and Wai-panaula. From all of them was reared *Opius humilis*, the African parasite. From the Kaawaloa lot we were agreeably surprised to rear the Australian *Opius* (*Biachasma tryoni*). This species was liberated under a tent in the Kona section at Honau-nau on June 12, 1913, and up to its appearance this month had not been observed.

HILO INSPECTION.

Brother M. Newell reports the arrival of eight steamers and two sailing vessels at the port of Hilo. Five steamers brought

vegetable matter, consisting of 271 lots and 3252 packages, all of which were passed as free from pests.

INTER-ISLAND INSPECTION.

During the month of August, 61 steamers plying between the islands were attended to and the following shipments were inspected and passed:

Plants	86 packages
Taro	776 "
Fruit	14 "
Vegetables	16 "
<hr/>	
Total passed	892 "

The following packages were refused shipment on account of infestation or of having objectionable soil attached to the plants:

Plants	14 packages
Fruit	26 "
<hr/>	
Total refused	40 "

Respectfully submitted,

E. M. EHRHORN,
Superintendent of Entomology.

DIVISION OF FORESTRY.

Honolulu, August 26, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I have the honor to submit as follows the report of the Division of Forestry for August, 1914:

FOREST RESERVE MATTERS.

On August 19 Governor L. E. Pinkham and members of the Board of Agriculture and Forestry held a public hearing at the office of the board to consider setting apart certain forest land in the districts of Kipahulu and Kaupo, Maui, as the Kipahulu Forest Reserve. The object of this reserve is to insure protection of the forest on the watersheds of important streams. The total area is 10,600 acres, of which 4600 acres is government land. No opposition developing, Governor Pinkham on August 20 signed a proclamation formally creating the reserve.

At the same hearing there was also considered the setting apart of three blocks of government land along the Volcano road above Glenwood, Olaa, Hawaii, that has never been taken up for homesteading. The object is to preserve as a forest park an accessible section of the native Hawaiian forest in its primitive condition.

The block of forest above Glenwood contains 374 acres. With it is included the seven and a half acres grove of koa trees at 29 miles and the narrow strips along the Volcano road between 18 and 24 miles, reserved when the road was built to protect the forest for scenic reasons. The area of the strips, now included as Section C of the Olaa Forest Park, is 150 acres, making the area of the reserve, as a whole, 531 acres.

The forest strips lying between 13 and 18 miles were not included, for the reason that the forest on them has almost entirely disappeared. This practically constitutes a recommendation to the Land Commissioner to dispose of these strips, under the law, as agricultural land.

The Kipahulu Forest Reserve is No. 36 in the chain of Hawaiian forest reserves. With the exception of two government lands on Oahu—Mokuleia on the Waianae hills and Hauula in Koolauloa—it practically rounds out the system and completes the reservation of the areas of forest needed for the protection of the watersheds of the Territory.

The Olaa Forest Park Reserve (No. 37) is included with the forest reserves largely for administrative purposes. It is set apart for its scientific interest and scenic value, rather than for strictly economic reasons.

The total area of the thirty-seven forest reserves in Hawaii now stands at 798,214 acres. Of this, 546,222 acres, 68 per cent, is land owned by the Territory.

The blocking out and technical reservation of the forest reserve system in Hawaii is practically accomplished. The problem now and for the future is how to manage these forests so that they shall be of the greatest possible service to the people of the islands.

Forest Fencing.

An inspection of the fencing along the government trail crossing the Lualualei Forest Reserve, Waianae, Oahu, was made by me on August 6. About half the posts were then in place. The work was progressing satisfactorily.

On the same day while at Waianae, I officially notified a squatter now making use of a portion of the Waianae Forest Reserve, to move his fence back to the proper boundary of his own lot.

Early in the month the final shipment of material was made

from Honolulu for the Waiaha Spring Forest Reserve fence in North Kona, Hawaii.

Issuance of a Mountain House Permit.

During the month, under authority given by the board at a meeting held on July 22, 1914, I drew up a form of permit granting to Mr. A. M. Brown the privilege of using a small portion of the Kula Forest Reserve on Maui for a mountain house and out-camp. In return for this privilege to use the land, Mr. Brown agrees to do certain tree planting on the upper slopes of Mt. Haleakala, particularly with conifers—pines, spruces and fir—from the temperate zone, which the board wishes to try out at that elevation. The permit is for a five-year period and is non-transferable.

FENCE POST INVESTIGATION.

Through a coöperative arrangement between the Division of Forestry and the College of Hawaii, a test of locally-grown eucalypts is about to be made on the college farm in Manoa Valley, where fenceposts cut from selected trees in the Tantalus forest will be tried out under the personal supervision of Prof. F. G. Krauss, superintendent of the farm. The species to be used are *E. robusta*, *E. globulus*, *E. citriodora*, *E. cornuta* and *E. calophylla*.

The felling and cutting-up of the trees will be done by Division of Forestry men; the hauling and setting of the posts by the college. From time to time statements of the progress of the study will be made by Prof. Krauss and published in the Hawaiian Forester and Agriculturist. As the trees from which the posts are cut are about thirty years old, these tests ought to be of value to all owners of eucalyptus groves in Hawaii.

ROUTINE MATTERS.

In addition to the usual routine work of the month I have, as far as possible, been rounding up all outstanding matters, so as to have no loose ends when I leave the Territory on August 26 to go to my new field of work at Cornell University. A series of notes and memoranda have been prepared that will enable my successor to get in touch at once with all current work. In the meantime, until a new superintendent of forestry is appointed, Mr. David Haughs, forest nurseryman, will attend to routine work and as usual carry on the activities of the section of forest planting.

I am leaving with the president of the board a report covering the work of the Division of Forestry from January 1, 1913, to August 31, 1914, which I suggest be included in the biennial

report of the board to the next Legislature. In it, after recounting briefly the happenings of the last twenty months, I have summarized what I feel to have been the important accomplishments of the Division of Forestry during the past decade, with certain recommendations for the future. I believe the suggestions there made are pertinent and worthy of adoption.

In concluding my work as superintendent of forestry and chief fire warden of Hawaii, I wish to express to the board my cordial appreciation of the support which the forest work has always received from the several commissioners, past and present. On very many accounts I go away from the Territory with regret. I trust I may still find many occasions to be of service in Hawaiian affairs. For wherever I may be located I shall always look back with aloha to my ten years of service in Hawaii Nei.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, August 31, 1914.

R. S. Hosmer, Superintendent of Forestry.

Dear Sir:—I herewith submit a report of the principal work done during the month of August:

Nursery.

Distribution of Plants.

	In Boxes Transplanted.	Pot Grown.	Total.
Sold	450	87	537
Gratis .....	...	1575	1575
	<hr/> 450	<hr/> 1662	<hr/> 2112

Collections—Government Realizations.

On account of plants sold.....	\$ 8.85
Rent of building, Nursery grounds.....	35.00
Half of cost of fence wire, Nahiku Homesteads.....	11.15
Total	<hr/> \$55.00

Preservation of Forest Reserves.

The sum of \$125 has been deposited with the Treasurer of the Territory as a special fund for the use of the Board of Agriculture and Forestry, collected as follows:

Rent of premises at Half-way House, Tantalus, at \$10 per month, April 1 to August 31, 1914.....	\$ 50.00
For use of land, Palolo Valley, April 1 to Sept. 30, 1914	10.00
For use of land gathering ti leaf, Pauoa Valley, April 1 to September 30, 1914.....	25.00
Permit to cut grass, Makiki forest, at \$20 per month, July and August	40.00
Total	<hr/> \$125.00

Tantalus Forest.

In accordance with an agreement between the Division of Forestry and the College of Hawaii, a number of trees have been cut and split into posts, the species being *Eucalyptus robusta*, *E. citriodora*, *E. calophylla*, *E. cornuta* and *E. globulus*. The college has agreed to test and record the durability of the different species in regard to their value as fenceposts. Two laborers were employed by us to do the cutting and splitting, and the college agreed to do the carting.

Makiki Station.

The work at this station has been principally routine and consisted of preparing and sterilizing soil, transplanting seedlings and so forth.

Honolulu Watershed Planting.

The planting of trees in the neighborhood of Sugar Loaf and Round Top is progressing and we will be able now, with the help of six additional men, to make good progress in planting the ridges and valleys lying between Round Top and the Tantalus forest. The trees already planted are doing very well and will very soon be showing above the grass and guava bushes.

Advice and Assistance.

The following in the number of requests for advice and assistance: Calls made in and around the city, 6; by telephone, 5; by letter, 6; at Nursery, 8. Total, 25.

Forest Fences.

The writer paid a visit to the Lualualei Forest Reserve at Wai-anae for the purpose of examining the fence just completed by J. K. Luka. The fence consists of two lines built across the reserve and running along both sides of the trail leading over Kolekole Pass. After making a thorough examination I found that the fence had been substantially built and the work done according to the plans and specifications.

The repairs to the forest reserve fence running along the mauka boundary of the Lualualei homesteads were also examined and found satisfactory. The latter were under the supervision of Mr. Alika Dowsett.

Very respectfully,

DAVID HAUGHS,
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

Honolulu, September 16, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the Division of Hydrography during the month of August, 1914, is submitted:

A comparison of the amounts paid per million gallons per 24 hours for government water under the various water licenses, has revealed the fact that there exists a wide variation in the prices paid under, apparently, similar conditions of cost of water development and application.

The data at hand cover most of the larger ditches on Kauai and Maui, and as a large part of these water license agreements terminate within the next ten years, these data should be carefully studied previous to the leasing of future water rights.

The investigation of the discharge of all ditches diverting government water is now being carried on, and it is anticipated that sufficient data will be available, when needed, to allow for an intelligent estimate of the amount of water furnished under each lease.

OAHU.

The coöperative experimental work with the H. S. P. A. Experimental Sub-station at Waipio was well started by the installation of three permanent weirs on the two main ditches which serve the greater part of the fields. These three weirs in connection with the Venturi meter at the source of supply will register the amounts furnished to and the amounts lost by seepage and

evaporation, in the two main ditches. Two steel portable weirs have been completed to make temporary measurements in the level ditches, which should show the losses incurred in this type of ditch. The actual hydrometric work will be undertaken during September and October.

Two water utilization and power investigations were started on the Kaluanui, Punaluu and Waihee watersheds.

Routine stream and rain-gaging operations and maintenance were carried on during the month, including hydrometric work in connection with the water supplies being investigated in connection with Honolulu's water supply.

The rainfall during the month continued above the average for this time of the year, in the catchment areas along the Koolau mountain range and on the windward coast. Rather exceptionally dry conditions prevailed between the Koolau and Waianae ranges and on the leeward coasts.

KAUAI.

Kauai reports that excessive rainfall conditions continue to prevail over most of the island, especially along the windward side.

Practically the entire month was used on routine stream and rainfall measurement operations in connection with the new stations recently established. A reconnaissance was made of the North Wailua and east branch of the North Wailua Stream to determine the materials needed for the new proposed clock register stations on these streams, the installation of which will put practically all government-owned water on Kauai under investigation.

A special series of measurements was made in connection with the Lihue Ice & Electric Power Co. in connection with turbine power tests.

MAUI.

During the month routine stream and rainfall measurements were made at 30 stream-gaging stations and four mountain rainfall measurement stations. The large rain gage maintained at the 1500-foot level in the Waihee Valley was visited. This gage has a capacity of 300 inches and during the period April 29 to September 1 collected 258 inches of rainfall, or a mean of 64.5 inches per month.

A section of the Honolua ditch was rated and a rating table furnished to the Honolua Ranch Co. to be used in making tests of the power plant now being established.

HAWAII.

Heavy rainfall in the vicinity of Hilo and Kamuela prevented further coöperative work for the Attorney General's department.

SEPTEMBER PLANS.

Oahu.

H. S. P. A. Experimental Station coöperative work will be carried on.

The investigation in connection with Honolulu's water supply will be extended.

Coöperative stream-measurement work for the U. S. Army, the Wahiawa Water Co., the Kahuku Plantation Co., the Laie Plantation Co., etc., will be done.

The special utilization investigations in connection with the Waihee and Punaluu streams will be carried forward.

Kauai.

Stevens clock registers will be established on the North Wailua and east branch of the North Wailua streams.

Maui.

Stream and rainfall-measurement work and general maintenance work will be done. An effort will be made to secure sufficient measurements at all new stations to warrant good ratings of these streams during the present year.

Hawaii.

Should weather conditions permit, further investigation work will be done for the Attorney General's Department in the vicinity of Hilo and Kamuela.

Very respectfully,

G. K. LARRISON,
Superintendent of Hydrography.

RHODES GRASS AND ITS INTRODUCTION INTO THE WEST INDIES.

Rhodes grass is a useful fodder plant known botanically as *Chloris Gayana*. It is a native of tropical Africa, but has been introduced into Australia and various other parts of the world. Towards the end of last year seeds of this fodder plant were imported into Montserrat, where, owing to its drought-resisting powers, it was thought that the plant would be an acquisition in the matter of providing food for live stock. Shortly afterwards, the question arose as to whether the introduction of a new species might not give rise to difficulties in regard to the control of its

spread into places where it was not required. An examination of all the more recent literature dealing with the economic value of this grass leaves little room for doubting its great usefulness, but caution must be exercised to keep it under experimental control at first until it is seen what its behavior is going to be under a new environment.

Before proceeding to deal with the economic characteristics of the plant, it may prove interesting first of all to say a few words about the distribution of the different species of this interesting genus. According to *Index Kewensis*, there are some species of *Chloris* which are indigenous to different parts of the tropics, but chiefly Africa. There are nine species and several varieties of the genus indigenous to Australia. In the West, there are several indigenous to tropical America, whilst *C. brevigluma* is a native of Cuba, and what is more interesting, *C. propinqua* is indigenous to Guadeloupe. In the present connection it is worth noting that the well-known West Indian grass *Cynodon Dactylon* has been described on one or two occasions wrongly as *C. maritima*.

According to the Kew Bulletin (1908, No. 1), most of the Australian species are excellent forage grasses, having a high reputation with stock owners, who know them as "Blue star grass" and "Dog's tooth star grass," as well as by other popular names. But according to the Queensland Agricultural Journal (Vol. XXVI, p. 164), it is the introduced species, *Chloris Gayana*, that has given most satisfaction. This grass has not only survived, but has grown luxuriantly through the long dry summer months, and has been regarded in many parts as a sort of nursery crop for any animals lacking in condition. In one place, the seed of this grass was sown at the rate of 2 lbs. to the acre together with 2 lbs. of *Paspalum dilatatum*—the well-known fodder grass which is gradually being ousted by *C. Gayana*. It is stated that Rhodes grass, unlike other quick-growing ones, is relished at all stages of development by stock, and does not deleteriously affect dairy products. It has proved a wonderful grass for resisting drought, and will grow and remain green when all other grasses, natural and artificial, are burnt up. It requires a less rich soil than *Paspalum dilatatum*. When harvested, it has an aroma that is not easily defined—very strong, but not unpleasant. It is said to make good chaff, especially when mixed with lucerne. In one trial, the yield per acre of hay was at the rate of 5 tons 7 cwt.

The comparative feeding values of the two grasses are discussed in the Agricultural Gazette of New South Wales (Vol. XXII, p. 238), where it is regarded as established that Rhodes grass has a greater nutritive value than *Paspalum* grass, being richer in protein and poorer in crude fiber. In this account it is mentioned incidentally that *C. Gayana* has a creeping stem which roots at the joints, but in a thick stand the stems are upright. This power to

percennate must be borne in mind in any considerations bearing upon the danger of this plant in the West Indies as a weed. At the same time the undoubted nutritive value and great drought-resistant powers of the grass are not likely to make its spread undesirable on stock farms.

In Florida and the intermediate region of America a good hay grass has long been a desideratum. It is stated in the Annual Reports of the Department of Agriculture of the United States, 1912, that Rhodes grass, secured from Africa, promises practically to solve the hay question for that portion of the South. Field tests of Rhodes grass are being conducted in Florida in order to determine its climatic and soil requirements and the yield of hay which may be expected. One field of 20 acres has been established near Brooksville, from which results on a commercial scale are expected. This plant has also been introduced into Arizona, where it promises to give much satisfaction, and it is understood that it is also being tried in Porto Rico. The results of these experiments will be awaited with interest.

Whilst discussing forage crops, it may not be out of place to conclude this article with a few remarks concerning other drought-resisting grasses, which have attracted much attention during the last few years. In the Monthly Bulletin of Agricultural Intelligence and Plant Diseases (June, 1913), a note says that Teff (*Eragrostis abyssinica*) was introduced into the Transvaal in 1903, and has since proved itself a complete success, and is fast becoming a staple hay crop throughout civilized Africa, its qualities being palatability, high nutritive value, heavy yield, rapid growth, drought resistance, and ability to smother weeds. Another well-known grass, namely, Soudan grass (*Andropogon halepensis*), is reported in the same journal for July, 1913, to have been imported into the United States from Soudan in 1909. This grass yields well, especially in dry seasons, and the fodder is much appreciated by stock.* The last grass to which we invite the reader's attention is known as Elephant grass or Napier's fodder (*Pennisetum purpureum*). The cultivation of this plant is described in the Monthly Bulletin of Agricultural Intelligence and Plant Diseases (November, 1913). It has proved a very drought-resistant and heavy-yielding fodder crop in Rhodesia. Owing to its succulent character and coarseness of stem it does not make good hay, but as green fodder for stall-fed animals, it can hardly be excelled by any other crop in Rhodesia. In damp situations, where water is liable to stand, it wilts, and is then best replaced by *Paspalum*, or

* A word of caution, however, is here necessary. *Andropogon halepensis* is synonymous with *Sorghum halepense* (Johnson grass)—a plant which when introduced into many places has eventually become for a time uncontrollable as a weed, and has only been eradicated after much difficulty and expense. Drought-resisting grasses are not always unmixed blessings.

by Rhodes grass. In dry situations or in cold localities, it is much to be preferred to sugar cane, and will give better results both in weight of fodder and in food value.—The Agricultural News.

THE SPELLING OF "COCONUT."

The Editor of the Tropical Agriculturist.

Dear Sir:—The following from the Ceylon Morning Leader will prove of interest to your readers:—"The Spelling of 'Coconut.'—Sir Everard im Thurn, speaking at the Royal Horticultural Society, said the nut now known as 'coconut' was similar to the face of a monkey, and so the Spanish word 'coco,' meaning a grin or grimace, was attached to it. When Dr. Johnson was writing his famous dictionary he had an article on the 'Coconut,' but a careless proofreader passed a mistake in the spelling of the word, the compositor having inserted an 'a' and the word appeared as 'cocoanut.' This spelling became general, but the nuts are now known as 'coconuts,' 'kokernuts,' and 'kokers.'"

The present universal spelling "coconut" is rightly claimed to have originated with the Tropical Agriculturist, and the general adoption of the spelling, dropping the extra "a," has materially assisted in establishing the spelling in newspapers and magazines all the world over—the more recent but illogical American "kokers" and "kokernuts" notwithstanding; as this form not only gives a longer sound to the word than is otherwise given it, but would appear to the average reader an entirely new product.

But there are other relative forms of spellings which are often confusing and misleading—not variations regarding one article, but various articles being known by similar names. This fact deserves the serious attention of experts, who should agree to adopt names that would avert confusion.

I refer to the "Cocoa" as still to be seen in the writings of an older generation before *nut* in referring to the Coconut (*Cocos nucifera*); "Cocoa" and "Cacao" meaning the "Chocolate fruit"—as is often heard in the streets of Colombo and occasionally at Peradeniya on passenger days—(*Thebroma*, *Cacao*); and "Coca" (*Erythroxylon coca*).

Mr. O. W. Barrett, I think, it was who in the course of a treatise on the subject stated that in dealing with *Cacao* from an agricultural and botanical point of view he would leave the manufacturer to deal with "Cocoa"—indicating the origin of the irregular form.

Now that we have "Coconut" fixed and in universal use, and "Coca" not being likely to change, will it not be more in keeping with science to do away with "Cocoa" altogether and substitute the more correct form "Cacao," which will leave three articles that are at present often confused with one another, on separate

forms of spelling and pronunciation, with the least possibility of confusion?

I suggest the Tropical Agriculturist give the lead in adopting *Cacao* as the proper spelling, so that we may have:

Cacao (*Theobroma, cacao*),

Coca (*Erythroxylon coca*),

Coconut (*Cocos nucifera*).

Yours faithfully,

J. S. DE SILVA.

[Our correspondent is not quite correct in stating that *Coconut* is the universal spelling. Probably the vast majority of people spell the word with an *a*. Turning up the Stores List we find "Cocoanut biscuits," "Cocoanut oil"; and confectioners and traders throughout the United Kingdom would spell the word in the same way. Again, while *Coconut* is probably more correct, *Cocoanut* is certainly not incorrect. Thus the Century Dictionary after an exhaustive explanation of the origin of the two forms of spelling adopts *Cocoanut* in the text. Nor are we prepared to scrape the word *Cocoa* especially as *Cacao* is generally mispronounced. Indeed, if we are to come to origins, the ultimate criterion after all of what is correct, *coconut*, *cocoanut*, *cocoa*, *cacao* would all go overboard as designations of trees. The coconut palm was at one time called the *cocoa-tree*; *cocoa* or *cacao*, whichever is preferred, the *chocolate-tree*, and is so called now in some countries.—Ed. T. A.] — Tropical Agriculturist (Ceylon).

BAVANAS.

The experiments of R. G. Bartlett in Ceylon, in the way of manuring bananas, show that potash is the essential portion of a banana manure, manures wanting in this agent being of little or no good. Mr. Bartlett advocates the manuring of virgin land. The manure he found to give the best results financially consisted of 4 lb. of dried blood, 2 lb. sulphate of potash, and 2½ lb. superphosphate per stool.—*Wealth of India*.

PASSING OF THE HORSE.

"The horse (says the *Pinang Gazette*) has played an important part in the world's affairs, and from a purely sentimental point of view, it is difficult to regard his passing without some feeling of regret. But sentiment has to be stifled in these commonplace days, and it is a cold irrefutable fact that the introduction of machine power is so much appreciated that it will soon be time to consider whether horse traction, with its incurable, objectionable conditions attaching it, should be permitted at all in cities and

towns. We in Pinang have no reason to deplore the passing of the horse," to which we would add, neither should the growers of coconuts. The passing of the horse is creating new demands from old-established industries for substitutes for horsehair. Incidentally, coconut fiber is fast taking the place of horsehair for the stuffing of chairs, omnibus, railway and other seatings, and bedding mattresses, and is found to be a cleaner and more wholesome, germ-proof article, with equal resiliency.—*Tropical Mail*.

UNRECOGNIZED LUXURIES.

It is astonishing how little is known in England of any fruits outside a very limited selection. Yet there are a large number of excellent fruits which, if the public taste could only become familiarized with them, would become popular and important items in tropical imports.

There are few fruits which surpass in exquisite flavor the mango, such as may be got in Bombay and other parts of the eastern tropics. Difficulties of carriage of this rich, juicy fruit have perhaps chiefly interfered with its introduction into European markets, but once let its merits be appreciated by the public and these difficulties would not prove insuperable.

The mangosteen, again, is a most delicately flavored fruit—the cherimoyer of Peru, a species of anona, as is also another species of the same fruit, the sugar apple.

The avocado, or alligator pear, which grows in many ranches in tropical America—the chico or sapodilla; the guava; the roselle and the papaw (papaya), a large fruit not unlike a melon.

All these and many other fruits, varied in character and flavor, are well worthy of attention on the part of the European gourmet.

Bananas are every year more in evidence in the London markets, and will grow still more in public estimation as their mode of ripening becomes better understood. Today they are only too often eaten in a half-ripe condition, their appearance when perfectly ripe being misunderstood for one of decay.—*Tropical Mail*.

THE FOOD OF THE PEOPLE.

It would be difficult to imagine a foundation for investment more sure, more permanent and more steadily remunerative than that of the food of the people. Under pressure of urgent necessity or misfortune many articles of daily use might be dispensed with, but food is indispensable. And food is one of the chief products of the tropics in which investment is invited—butter, lard, confectionery, cocoa, coffee, fruits, etc.

Second only in importance to food are a number of articles intimately associated with our daily life, which may almost be

called necessities of civilization. Soap, candles, mats, mattresses, ropes, yarns, food for our cattle, stuffing for furniture and other things. All these are manufactured, in the best and yet cheapest form, from products of these same countries.—*Tropical Mail*.

“In China,” says the Barbados Standard, “a man who killed his father has been executed, and along with him his schoolmaster, for not having taught him better!”

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A complete list of the publications of the Board available for distribution (together with the titles of certain issues now out of print) is to be found on the cover of the last biennial report.

Applications for publications should be addressed to the Mailing Clerk, P. O. Box 207, Honolulu, Hawaii.

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The Division of Hydrography has on hand free publications relative to the water resources of the Hawaiian Islands. These publications furnish detailed data as to daily, monthly, mean, maximum, and minimum run-off of streams and ditches, and also cuts and maps pertaining to the different islands. Much descriptive data relative to the mountain ranges and physical configuration of each island are also contained. These publications will be mailed free of charge on request.

The United States Geological Survey topographic map of Kauai is also on sale, and copies will be mailed on receipt of 50 cents.

The records and maps of this division are available for inspection by any one who desires information relative to water resources, topography, etc. Blue print copies of hydrographic data relative to any stream, ditch, spring, etc., which may be under observation by this division will be mailed free of charge on request.

This division will also make ditch seepage losses and utilization investigations when the actual cost of the labor, materials, subsistence, transportation, etc., of such investigations is paid by those benefited.

G. K. LARRISON,
Superintendent of Hydrography.

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DIVISION OF FORESTRY.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

DAVID HAUGHS,
Acting Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent.

THE HAWAIIAN FORESTER AGRICULTURIST

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An introduction to some of the rare scenic resources of the Island of Oahu is furnished in the illustrated account, in this number, by Professor MacCaughey, of a biological expedition over the Koolau mountains.

Gratification will be felt by all who have taken an interest in the fruit fly control campaign on reading the report of the investigations made by Mr. Giffard and Dr. Back of the extent to which the Silvestri parasites have become self-colonized in the coffee and fruit fields of Kona. It is pleasing in itself to know that the expedition of the Italian scientist to Africa last year has not gone for naught, through failure of the first part of the problem which might have happened by the dying of the original parasites he brought here, but the keenest satisfaction is found in the evidence now presented that not only have the beneficial insects lived to propagate their kind, but their progeny appears to be doing effective work in keeping down the pest. Mr. Giffard's observation that the infestation of coffee berries in Kona is now fifty per cent less than a year ago is most encouraging testimony.

Besides the usual record of pests kept out of the Territory, the report of the superintendent of entomology for September contains encouraging data on fruit fly control.

Nearly thirty thousand plants distributed in one month, to the general public and corporations, as reported for September by Mr. Haughs, form a record for the division of forestry which should be a matter of pride to the entire Territory.

Hint of the possibility of a billion-dollar reservoir in the region of Kahuku, Oahu, given in the report of the superintendent of hydrography for September, is just one inkling of what the scientific measurement, control and utilization of the water resources of these Islands mean to their industrial, commercial and social development.

DIVISION OF ENTOMOLOGY.

Honolulu, September 30, 1914.

Board of Commissioners of Agriculture and Forestry, Honolulu, T. H.

Gentlemen:—I respectfully submit my report of the work performed by the Division of Entomology for the month of September, 1914, as follows:

During the month 32 vessels arrived at the port of Honolulu, of which 18 carried vegetable matter and one vessel moulding sand.

Disposal.	Lots.	Parcels.
Passed as free from pests.....	1444	37,157
Fumigated	1	6
Burned	12	27
Returned	1	1
Total inspected	1458	37,191

Of these packages, 36,996 packages arrived as freight, 110 packages as baggage of passengers and immigrants, and 85 packages through the postoffice.

RICE AND BEAN SHIPMENTS.

During the month 18,044 bags of rice and 1786 bags of beans arrived from Japan, and after careful inspection were passed for delivery.

PESTS INTERCEPTED.

Nine packages of fruit and one package of vegetables were found in the baggage of passengers and immigrants from foreign countries; these, being contraband, were destroyed. Six bay trees arriving from California were found slightly infested with a leaf-curling *Psyllid*. The plants were fumigated and all infested leaves were removed before delivery. Sixteen crates of California peaches were found infested with peach-worm *Anarsia linatella* and were destroyed by burning. Three packages of plants arrived by the Ventura from Sydney, N. S. W., which were free from pests, but the soil about them was removed before delivery. One package of plants arrived from British Columbia by parcel post and was returned to sender as being prohibited under the postal regulations of the federal horticultural board.

BENEFICIAL INSECTS.

During the month 8000 parasites of fruit fly and horn fly were liberated. Of these, 3000 horn fly parasites were sent to Maui

and 2700 horn fly parasites, as well as 500 *Opius* for the fruit fly, were liberated on the windward side of Oahu; 400 *Opius* were liberated at Ainahau and 800 *Chalcids* and 600 *Galesus silvestrii* were liberated in squash fields in the lowlands.

From the small lot of Australian parasites, *Diachasma tryoni*, reared from coffee berries from the Kona district we have been able to rear only male parasites in the insectary. The same experience was had when Silvestri first brought them here. Nevertheless, the fact that we have been able to rear the parasite from Kona material indicates that the parasite has established itself there.

HILO INSPECTION.

Brother M. Newell of Hilo reports the arrival of ten steamers and one sailing vessel at that port. Six steamers brought vegetable matter, consisting of 208 lots and 3479 packages, all of which were passed as free from pests. The steamer Kiyō Maru also arrived direct from Japan, bringing 7395 bags of rice, 193 bags of beans, 15 bags of peas and 25 bags of peanuts, which shipments were found to be free from pests of any kind.

STORE INFESTATION.

During the month E. O. Hall & Son called my attention to a pest destroying the soft hair brushes in their store. I immediately investigated the trouble and found the brushes attacked by the buffalo carpet beetle *Anthrenus scrophulariae*, a very common pest in houses on the mainland, generally attacking rugs, carpets, furs, etc. I advised them to send all their infested packages to the fumigating room on the Alakea dock for treatment, which they gladly did. After a forty-eight-hour fumigation, which penetrated every box and crevice, we found all the pests dead.

INTER-ISLAND INSPECTION.

During the month of September 63 steamers plying between the islands were attended to and the following shipments were inspected and passed:

Plants	62 packages
Taro	985 bags
Vegetables	50 packages
<hr/>	
Total passed	1097 "

The following packages were refused shipment on account of infestation or of having objectionable soil attached to the plants:

Plants	8 packages
Fruit	28 "
	<hr/>
Total refused	36 "

Respectfully submitted,

E. M. EHRHORN,
Superintendent of Entomology.

DIVISION OF FORESTRY.

Honolulu, September 30, 1914.

Albert Waterhouse, Esq., Acting President and Executive Officer,
Board of Agriculture and Forestry, Honolulu.

Dear Sir:—The following report gives the principal work done during the month of September, 1914:

NURSERY.

Distribution of Plants.

	In Seed Boxes.	In Boxes Transplanted.	Pot Grown.	Total.
Sold		150	519	669
Gratis	8500	1415	1713	11,628
	<hr/>	<hr/>	<hr/>	<hr/>
	8500	1565	2232	12,297

COLLECTIONS.

Collections on account of plants sold amounted to.....	\$11.15
Rent of building, Nursery grounds, for month of August..	35.00
	<hr/>
	\$46.15

PLANTATION COMPANIES AND OTHER CORPORATIONS.

The distribution of plants under this heading amounted to 17,000 in seed boxes.

MAKIKI STATION.

The men at this station have been busy getting up a stock of trees for the coming planting season and Arbor Day. We have now in stock large numbers of the species that are in demand.

HONOLULU WATERSHED PLANTING.

The work connected with the planting of the waste land lying between Round Top hill and Tantalus forest is progressing, and a large number of holes for trees have been dug. All of the area first planted has been gone over and the trees cleared of weeds. The total number of trees planted during the month amounted to 711 (koa 349 and kukui 362). More planting will be done during October.

TREE PLANTING.

Moloaa Forest Reserve, Kauai.

From the 24th to the 27th of September the writer was away on a trip to Kauai. The trip was made for the purpose of completing arrangements in regard to the planting of tree seed on the Moloaa forest reserve. An examination of the tract was made and instructions given to Mr. Kaina D. Lovell, who is to have charge of the planting, how to proceed with the work. A commencement will be made on October 1 with four men. The conditions at this time are very favorable to the direct planting of seed. The amount to be spent on this work is not to exceed \$500.

Koolau Forest Reserve, Maui.

Arrangements have been completed with Mr. W. A. Anderson, Nahiku, in regard to the planting of a double line of trees along the boundary fence between the Koolau forest reserve and the Nahiku homesteads. Trees for the purpose will be forwarded from our nursery here about the end of October. The amount to be spent is not to exceed \$200.

Waihou Spring Forest Reserve, Near Olinda, Maui.

The tree planting on the reserve will be in charge of Mr. L. von Tempsky, who has agreed to transplant and plant out the seedlings. The trees will be shipped from the nursery here in seed boxes to Paia. From Paia Mr. von Tempsky will cart them to the reserve. The trees will be forwarded about the beginning of November. The amount to be spent is not to exceed \$200.

Pupukea Forest Reserve, Oahu.

Another tree-planting proposition which is pending and will be arranged for during October is the Pupukea forest reserve, on this island. The writer will make a trip to Pupukea in a few days and draw up a planting plan for the reserve, for which an allotment of \$200 has been made.

ARBOR DAY.

Arrangements are being made, as in former years, to observe Arbor Day, and a large supply of trees is on hand for that purpose. The superintendent of public instruction has been notified of the different species available, and he is sending out communications to the principals of all the schools in the Territory. Notices to the general public will be published in the various papers, stating the number of trees each applicant will be entitled to, also the names of the species available. Arbor Day takes place on November 20, according to the Governor's proclamation.

ADVICE AND ASSISTANCE.

The writer has made the following calls and answered questions verbally and by letter as follows:

Calls in and around city, 5; by telephone, 4; at nursery, 6; by letter, 6.

Very respectfully,

DAVID HAUGHS,
Acting Superintendent of Forestry and
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

Honolulu, October 15, 1914.

Board of Commissioners of Agriculture and Forestry, Honolulu, T. H.

Gentlemen:—The following report of operations of the Division of Hydrography for the month of September, 1914, is submitted:

STORM OF SEPTEMBER 22-27.

The heaviest storm for many years occurred on the islands of Kauai and Oahu on September 22 and 23. The storm broke with greatest intensity over Kauai, and evidently struck Oahu first in the vicinity of Kahuku, as the greatest floods occurred in that vicinity. Large floods occurred on all streams heading on the Koolau mountain range. From all available reports, while a great amount of rain fell on Molokai, Maui and Hawaii, the floods were of lesser intensity than on Kauai and Oahu. So far as the hydrographic work is concerned, little damage was done. No damage has been reported from Kauai and Maui. On Oahu the damage was small, being limited to the washing out and loss of six staff gages, the wrecking of a cableway, without the loss of the cable and car; and the ripping out of a concrete slab which

formed the control of the middle branch of the Malaekahana stream, near Kahuku. All of the equipment lost and damage done has been replaced and repaired at a low cost.

Lihue rain gages registered nearly 15 inches for the 24 hours ending September 27, a. m. On September 22 the Waihee rain gage registered 10.7 inches and the Hana rain gage registered 12.8 inches. The total rainfall for the month at Keanae was about 45.0 inches.

FLOOD MEASUREMENTS.

The September floods enabled the engineers on the islands of Kauai, Oahu and Maui to secure much needed flood measurements, on many streams; and the data obtained are of great value in determining the maximum run-off of streams. As a rule floods in Hawaiian streams run off so rapidly that it is rare that an engineer can reach the station in time to secure measurements. The September floods were sustained sufficiently long to enable men to get to the stations before these subsided.

The coöperative stations constructed by the Kahuku and Laie plantations were established primarily to register the flood run-off of the streams in that vicinity. This information is desired to determine whether or not the construction of a billion-gallon storage project in that vicinity would be justified.

OAHU AND ADMINISTRATION.

During September four papers relative to hydrographic and conservation subjects were prepared.

One two-thousand-word memorandum was prepared for the Chamber of Commerce, which covered the general scope of the work, the work already accomplished, the work now in hand, and the results to be worked for.

A two-thousand-word article relative to the hydrographic work was prepared and mailed for publication in the 1915 Hawaiian Annual, at the request of Mr. Thos. G. Thrum.

A three-thousand-word article on Conservation was prepared and 50 lantern slides were made from photographs pertaining to this work were purchased. This article is to be read and the views shown to a gathering of Kauai people under the auspices of the Mokihana Club at Lihue, on October 16 or 17.

A three-thousand-word article relative to Hawaiian hydrographic and conservation conditions was written. This article will be presented at a conference of government engineers at Washington, D. C., in December, 1914.

A large amount of stream measurement work was accomplished. Fifty-two stream and ditch measurements were made and three rain gages were visited. Six staff gages were re-

placed, one cable-way was re-erected and a considerable amount of general trail and stream bed clearing work was done.

The Kunawai spring in Honolulu was measured and found to be discharging about 720,000 gallons per 24 hours.

KAUAI.

The installation of a new continuous register on the North Wailua river, at an elevation of 650 feet above sea level, was completed on September 26. The new station was not damaged by the heavy flood of that date. The construction plant was moved to the new station site on the east branch of the North Wailua river and work was begun on the trail necessary to reach this station.

Sixteen rain-gaging stations were visited and 17 stream measurements were made.

MAUI.

Mr. Bailey spent 25 days in the field, visited 29 stream-gaging stations, and made 21 stream measurements. Several days were spent on clearing and repairing foot trails leading to stations.

The following tabulation shows the status of stations maintained:

NUMBER OF STREAM-GAGING STATIONS.

Island.	August 31.	Established	Discontinued	September 30.
		During Month.	During Month.	
Kauai	37	1	2	36
Oahu	51	0	1	50
Maui	43	0	1	42
Hawaii	1	0	0	1
Total	132	1	4	129

Very respectfully,

G. K. LARRISON,
Superintendent of Hydrography.

The best excelsior is made from basswood, or linden. Aspen and cottonwood, however, supply nearly half of the total amount manufactured.

The King of England has given permission to have a part of the royal estate placed at the disposal of the school of forestry at Cambridge University for purposes of experiment and demonstration.

THE KOOLAU MOUNTAINS BETWEEN WAHIAWA
AND KAHANA, OAHU.

By VAUGHAN MACCAUGHEY, *College of Hawaii.*

Being a Report upon a College of Hawaii Biological Expedition,
December 16-18, 1912.

The purpose of this expedition was a biological reconnaissance of the rich and varied mountainous country lying between Wahiawa and Kahana. This region has been traversed by various civil and military expeditions, but has never received detailed



View of Kahana Valley from the Koolau *pali*.

biological consideration. It was hoped during the present trip to ascertain the general topographic and life conditions, preparatory to intensive surveys to be made later.

Prof. Bryan gave attention to the animal life, particularly the fresh water and arboreal molluscs; and to temperature records

of atmosphere, streams and pools, as related to the geographic distribution of *Melania*.

Prof. MacCaughy took barometric and anemometric observations; made a photographic record of the region traversed, and collected algae and liverworts.

Mr. Shaw collected spermatophytes, giving particular heed to Lobeliaceae. At 10:20 a. m., December 16, the party left Honolulu for Wahiawa, on Oahu Railway train.

At 12 m. the party left Wahiawa Station and started *mauka* along the main road running towards the Koolaus. The sky was clear, with cumulus clouds heaped along the main ridge of the Koolaus.

After proceeding along the road for a mile, we stopped and lunched. A pleasant breeze was blowing; the anemometer gave a reading of 880 feet in 2 minutes, or 440 feet per minute. The barometer showed an elevation of 1050 feet.

After lunch we proceeded *mauka*, striking the "headgates" trail at the end of the road, and following it. The army engineers have improved this trail by clearing it, and by making "corduroy" pathway over the most boggy places. Painted guide signs have been placed at suitable intervals. One of these signs, marked "To Kahana," is placed at a bifurcation in the trail—that to the right hand being cut, but not graded, and leading up towards the upper side of the valley; the other, leading downward towards the stream to the left, is both cut and graded, and is the "headgates trail," leading to the cabin at the intake.

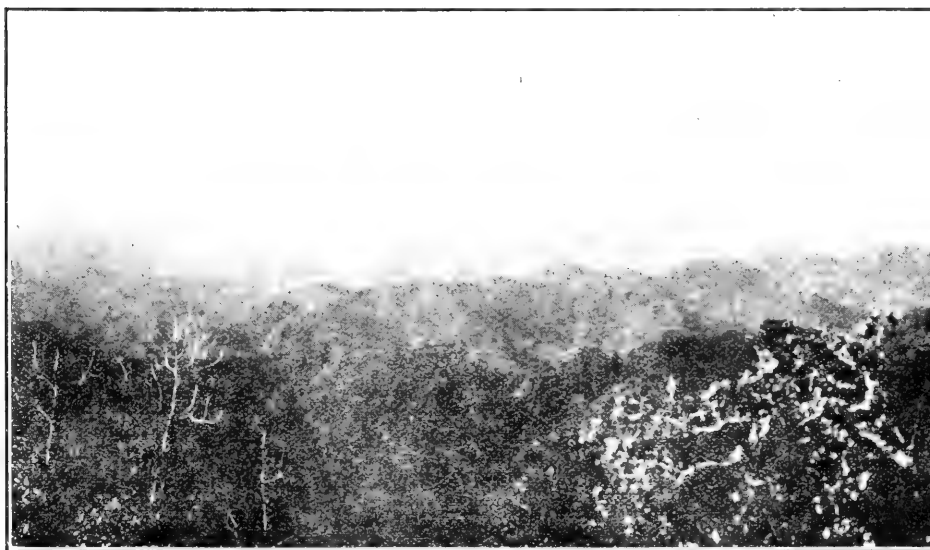
This fork in the trail is of considerable importance to the traveler, for at this fork one chooses between two trails up to the Kahana pali. The left-hand branch leads to the cabin, which affords shelter for the night. The grade is easy to the cabin, and the trail from the cabin to the pali consists of two hours' wading up a cold and rocky stream, and then a hard scramble up a steep and jungle-grown "hogback" ridge to the pali. The right-hand branch leads up to the ridge that bounds the valley to the right. To follow this ridge up the pali means much up and down travel, and no shelter at night.

We took the right-hand branch, and followed it along the ridge crest until 5 p. m. At this time we decided to pitch camp, and in order to find a suitable place near water, dropped down a side spur to the left. The point at which we left the main ridge to descend the side spur has an elevation of 2000 feet. We marked it with a conspicuous blaze (two crosses to the left). At this point, if we had known what lay ahead, we should not have descended at this place, for the next morning, after 1¼ hours' travel on along the ridge, we came to an Army sign, "To water, 200 yards below the trail." If we had known of this camping place, we would have hastened to it.

However, we descended as before described, and after fifteen



View of the eroded Koolau peaks as seen from the Kahana *pali*.



View across the highly-eroded and densely-forested ridges of the
Kaukonahua region.

minutes discovered pools of water in a steep streamway. Nearby the pools was a magnificent *loulu* palm. We camped here, and named the place *Loulu Camp*. We collected firewood, made a sleeping place of saplings and palm leaves, ate supper, and slept under a warm and starlit sky. The early part of the night was moonlit. The weather remained ideal for our trip. The elevation of Camp Loulu is 1800 feet. The temperature of the pools of water was 60° F. In the morning we cleaned the litter out of the largest pool, and piled up the palm leaves that had proven so useful. We broke camp at 8:30 and climbed the spur, and continued *mauka* along the main ridge. The main criticism of this ridge trail is the numerous elevations and depressions, that soon prove tedious. Otherwise, the trail is well cut, and affords many magnificent views, on one hand, across Kauhakalaua Valley and, on the other, across Waikakalau, Pearl Harbor, Ewa and the Waianae Mountains.

After 1¼ hours' travel we reached the Army sign above referred to. At this point the ridge becomes somewhat steeper. At 10:40 a. m. we reached the summit, and gazed down into Kahana Valley, and across the intervening hills towards Kaneohe Bay and Mokapu Point. The summit knoll which we had attained has an elevation of 2500 feet; the air temperature was 68° F.; the soil temperature (4 inches down) was 64° F. The wind velocity was 1420 feet in 2 minutes, or 710 feet per minute. The wind appeared to be of average strength, judging from its "feeling."

We lunched on the summit, and then followed the trail, which leads to the left along the backbone of the Koolaus, and is plainly marked, "To Kahana," by an Army sign. On the next knoll is another sign, "To the Intake," but this refers to the same trail, and no confusion need be made. The trail continues along the summit for at least a quarter of a mile, and then turns sharply down a prominent ridge that leads precipitously down into Kahana Valley. This ridge is very steep, but the trail is well marked, and is easily followed.

At 2:30 we had dropped 2000 feet, and were at the pandanus grove at the foot of the ridge. This grove is 500 feet above sea level; the pools of water near it were 68° F. Upon reaching the Kahana Stream, Professors Bryan and MacCaughy began collecting aquatic material, Mr. Shaw leaving the party and planning to walk back to Honolulu that same night. He went as far as Heeia, and reached Honolulu the next morning.

We went more leisurely down stream, collecting at various points, and arriving at Kahana Station at 5 p. m. We remained over night at the residence of Mr. Leckenby.

Next morning, December 18, Professor Bryan continued his *Melania* investigations throughout the lower courses of the Kahana and Punaluu streams; Professor MacCaughy collected lit-



Camp Loulu, showing dense "rain forest" vegetation.

toral material, and procured photographs of *Colocasia* and *Nan-
thosoma*.

At noon we took the train to Kahuku, and from there to Honolulu, arriving at 5:30 p. m.

NEW USES FOR INDIA RUBBER.

India rubber is the Jacob, the supplanter, of the industrial world. Rubber hose dispossessed hose of leather, the rubber-covered golf ball drove out the "gutty," the motor banished the horse. No industry or profession but has shown rubber supplanting some time-honored object. Take, for example, the case of King David as chronicled in the first book of Kings. "David was old and stricken in years and they covered him with clothes, but he gat no heat." Then his servants got a young maid who lay in his bosom to warm him. This system presumably prevailed among elderly kings until 1850 or thereabouts, when india rubber in the form of hot water bottle supplanted the feminine heat supplied, and has done so to a degree, ever since.

Industrially it has insinuated itself everywhere, displacing wood, metals, fabrics and only rarely making a new and original use for its wonderfully adaptable self. It was its costliness only that kept it from further encroachment.

With rubber at a shilling or twenty-five cents a pound (and that is where it is said to be going), the great expansion in its

manufacture will be in the line of further and greater encroachment.

Let's afield with fancy and picture its progress:

The growth that will come in automobile and motor truck tires has already been forecasted, but the impetus to be given to other established lines does not seem to be appreciated. All will grow greatly. The only obstacles are the increasing cost of labor—which is the most serious—and high prices for fabrics, solvents and ingredients.

INDIA RUBBER LEATHER.

In footwear of leather, rubber has already made itself a factor.

Aside from the cements used in channeling and filling, the rubber heel and sole have displaced quite a percentage of those made of leather. With low-priced, high-grade rubber, leather in soles for footwear, material for trunks, straps and a score of other uses, including machine belting and harnesses, is sure to give way to its more adaptable rival. As for shoe uppers, leather is used theoretically because of its porosity that allows heated air to escape and absorbs perspiration—this in spite of the fact that the leather is filled with oil and blacked and varnished. It is quite possible that a mixture of fiber and rubber will appear that will be cool, odorless and blackable.

As for patent leather, it is sure to be supplanted by a smooth, glossy-surfaced rubber product on a cloth backing that will not crack and will be far cheaper than the high-priced leather products. This will open a field in footwear, shopping bags, ladies' belts, etc., etc.

Indeed, wherever leather is used today rubber will soon prove a formidable rival.

INDIA RUBBER LUMBER.

Mats, matting and tiling of india rubber are already extensive factors in home, office and factory furnishing. But why not flooring of hard or semi-hard rubber? As has been proved in tests of tiling wear, it will outlast stone or wood. It can be made in any color. Certainly at the present price of hardwood flooring, with rubber at 25 cents a pound, it could compete. Nor would it need varnishing, waxing or oiling—simply polishing. It could easily be molded with a semi-hard lower side for nailing and be matched and furnished in strips of any length or width. It would be practically fireproof, and not inflammable as is varnish-covered wood, and would neither swell nor shrink, as it would be moisture-proof and vermin-proof. For a white-ant country it would be invaluable. In cabinet work, hard rubber veneers to imitate ebony, mahogany, bog oak or any of the darker woods

are easily made and the richest effects secured. For furniture, solid mahogany sideboards, tables and chairs may be superseded by those made of hard rubber.

In other words, hard rubber lumber is in sight—the lumber sawed, planed and turned as lumber is today and the sawdust not a waste product but molded into new lumber, and the furniture or panels or flooring after use returned to the mill that made them, and these, too, made into just as good hard rubber lumber as when first manufactured.

Better than rubber roofing will be the fiber and rubber shingles of the future. If the underwriters are fussy the fiber may be asbestos or the compounding ingredient infusorial earth.

Boat-builders (wooden boats) have trouble with their lumber. When hard rubber lumber is available they will rejoice. It will be hard on those who sell copper sheath or Anti-Teredo paints; for the busy water borer will not touch rubber.

Speaking of hard rubber lumber, who can say that a factory for turning it out will not one day be established in Singapore, to make boxes in which to ship rubber? The boxes, of course, to be sawed up into short vulcanite sheets for insulation work, once their duty as rubber carriers is finished. At least it would not be difficult to make wooden boxes with a thin coating of hard rubber vulcanized to the wood, forming a clean anti-sliver coating. Such boxes could easily be ventilated and should find use when empty.

Great European ports send to South America for Greenheart logs to build their docks, and a costly product it is. Iron columns covered with a thin film of hard rubber should be cheaper and far more durable. So, too, the protection of iron and steel in scores of places where they perish from oxidation would prove a simple, effective solution of this evil.

SEMI-HARD PIPE.

As liquid conductors there is a possibility that semi-hard rubber piping may compete with copper and lead pipes. So, too, lead armored cables may give way to those coated with semi-hard rubber. The product would be just as flexible, much lighter, and cheaper.

INDIA RUBBER WOODENWARE.

In the line of sports will come hard rubber golf clubs, cricket and baseball bats, fishing rods, polo mallets and balls, and so on. The city policemen will no longer use a club of locust wood; it will be of hard rubber. And this will extend all through the line of woodenware where anything especially tough, flawless and fine is required.

RUBBER LINOLEUM AND OIL CLOTH.

Speaking again of floor coverings, oil cloth and linoleum as such cannot exist once rubber is really cheap and plentiful. Every

rubber manufacturer knows that a pound of Para rubber will go as far in compounding as ten pounds of boiled or oxidized oil. The oil costs, say, seven cents a pound, and rubber at less than four times that price will certainly dispossess it. Then, too, it is more flexible, easier to work and far more durable.

Artificial leathers are likely to find it difficult to compete with the rubber product that will come in with low-priced rubber. Indeed, all of the rubber counterfeits made of cellulose, celluloid or casein, whether soft or hard, are likely to find that the original will be preferred just as soon as it is the cheapest.

RUBBER SOUND DESTROYERS.

India rubber as a deterrent to noise has gone far. It will go farther. The rubber-shod taxi-cab has stilled the echoing klip-perty-klip of the flat-footed cab horse. It should be used to silence the clash and clatter of the modern city electric car and the jar and clamor of elevated and subway trains. In a score of industries it is needed—as cushions under modern printing presses, laundry machines and other city nuisances.

Would it not be possible also to still the shrill clatter of the thousands of shuttles in great weaving plants by the use of rubber?

The boiler maker certainly needs some sort of rubber silencer for his work, and the pneumatic riveter will not be perfect until rubber cushions absorb the far-reaching sound of its blows.

When this is accomplished and the day of deliverance comes, every bell in Christendom should send out its peal of praise—with soft rubber tongues.

RUBBER GLUE AND MUCILAGE.

Into the broad field of glues, mucilages and other adhesives will a great variety of new rubber cements force their way. The only deterrent will be high cost of solvent. But with low-priced *Hevea* rubber and the consequent fall in the price of rubber scrap, that will be melted or distilled, and new stickers and valuable by-products will be obtained that will find wide markets. Certainly a rubber glue that would be self-vulcanizing and that would not soften and let go in damp weather would be a boon.

INDIA RUBBER ROADS.

Roadways of rubber are ideal, theoretically, but the asphalts under modern manipulation are likely to be always cheaper and just as effective. Rubber sidewalks (once a non-slipper compound is evolved) made of scrap are likely one day to run for miles in the modern city.

INDIA RUBBER PAINTS.

These have in the past been widely advertised and sold, but they were oil or asphaltum at heart, not rubber. Scrap rubber is likely to furnish actual rubber paints and real rubber roofing. It will mean experiment and adjustment and a new series of dryers, but that should not baffle the chemist in this day of rubber expansion.

RUBBER CAR SPRINGS.

As the price of rubber in the past increased, certain products disappeared—the rubber car spring for example. As an assistant for the excellent steel springs of today, with a new and lower scale of prices it will come back, not only in railway carriages, but in manifold places where cost has prevented its use. Wherever there is a shock there will be put a rubber spring; wherever a rattle, an anti-rattler.

INDIA RUBBER PAPER.

Goodyear had a book with pages of rubber and fiber. Then rubber became costly and it was forgotten. For certain moisture proof papers rubber is certainly better than oil. In wall papers of the Lincrusta Walton type it is more than a possibility. Bible papers made of pure gum would be wonderfully suited to certain modern creeds.

RUBBER CROCKERY.

It is with much doubt that I make this suggestion—that of white rubber dishes for the great restaurants, or bath tubs of hard rubber for the home. Perhaps it is as well not to encroach upon the pottery industry until rubber becomes as cheap as Kaolin.

The list grows long, and this is but a beginning; there are scores of industries yet to be viewed, and above all the backbone of all prosperity—the farmer—has been neglected. Perhaps—and this is but a vague suggestion—if he raised his milk-fed chickens on rubber latex, egg shells would cease to be fragile.—*India Rubber World*.

Six thousand bushels of lodgepole pine seed are being collected this fall on the Arapahoe national forest, Colorado, for use in reforestation work next spring.

William Penn, in his Charter of Rights, provided that for every five acres of forest cleared one acre should be left in woods. Foresters today maintain that on an average one-fifth of every farm should be in timber.

RECONNAISSANCE OF FRUIT FLY PARASITES.

November 12, 1914.

Board of Commissioners of Agriculture and Forestry, Honolulu, T. H.

Gentlemen:—During October, while in the Kona district on the Island of Hawaii, and while making casual investigations of a coffee field and its condition as to the presence of fruit fly, I noticed the presence in this field of a large number of *Braconid* parasites. Capturing some specimens my suspicion as to their identity was immediately confirmed. There were examples among them of *Opius humilis* and *Diachasma tryoni*, two of the Braconids which Prof. Silvestri introduced into Hawaii from South Africa and Australia respectively in May of 1913 (cf p. 5, Silvestri's report).

You will note in the report an account of the difficulty he had in breeding female specimens of these particular parasites under insectary conditions and that, rather than take undue chances on their multiplication by artificial means, it was decided to liberate the few remaining females of both species under natural conditions in the coffee fields of the Kona district. For this purpose Mr. D. T. Fullaway, who was at that time assisting Prof. Silvestri in the breeding work, was sent to Kona and there liberated four females and many males of the Australian species under two tents at Honaunau, South Kona, and three females and many males of the South African *Opius* under two tents at Holualoa, North Kona. These liberations took place on June 12, 1913. A further small consignment of the Australian species was sent to Kona for liberation about a month later. In October, 1913, or about four months after the liberation made by Fullaway, I sent to Honaunau and Holualoa for infested coffee berries from the one-fourth acre which I had made previous arrangements to have reserved in the neighborhood of each of the tents with a view to assisting the multiplication and distribution of these special parasites. From these samples we were successful in recovering the South African parasite (*Opius humilis*), but not the one from Australia (*Diachasma tryoni*). This fortunate recovery enabled us at that time to make a further distribution of the *Opius* not only in Kona, but also on most all the islands, including Oahu. Since then it has been repeatedly recovered in various districts from the fruit fly pupae bred out of several varieties of infested fruits. In August, 1914, from a sample of infested berries sent from Kaawaloa and Kiloa, Kona, a few specimens of the Australian species (*Diachasma tryoni*) were also recovered, but the same difficulty—as to the breeding of females under insectary conditions—was met with.

My recent observations in the coffee districts of North and

South Kona covered 26 to 28 miles of almost continuous coffee fields, eighteen fields about one and one-half miles apart having been investigated. The result showed that both the Australian and South African parasites were in evidence in all the fields in South Kona, while there was a scarcity of the former in those in North Kona. This may have been caused by the scarcity of ripe berries in certain fields visited. In North Kona both sexes of the Australian parasite (*Diachasma tryoni*) were captured over twenty miles from the original place of distribution, the date of which, as previously stated, was June 12, 1913.

Herewith I am submitting you a statement giving details of all the captures of these parasites in the many fields visited and which have been above referred to. You will note that all captures were made with a small hand net—by either sweeping or when the insects were on the wing, principally by the latter method.

During the above investigations I was accompanied and assisted by Dr. E. A. Back, who is in charge of the Federal fruit fly investigation here. Dr. Back also took samples of berries from each of the eighteen fields visited with a view to later determining, if possible, the percentage of fruit fly and parasites at the time of our visit.

In conclusion I will state that the infestation of the coffee berries by fruit fly in the Kona district is this year at least fifty per cent less than a year ago. In some of the fields it was difficult to find any great infestation at all.

Respectfully submitted,

W. M. GIFFARD,

President and Executive Officer, Board of Agriculture
and Forestry.

Investigations as to distribution of *Opus humilis* and *Diachasma tryoni* throughout the coffee fields in South and North Kona, either one or both of these having been collected by W. M. Giffard and Dr. E. A. Back in the following fields over a distance of twenty-six miles between October 28 and 31, both inclusive, viz:

(In all these fields Dr. Back gathered samples of ripe berries and either saw or took parasites, whilst Giffard confined his work to collecting adult specimens on the wing or by sweeping. In all instances only a small number of parasites were taken, many of those captured having been liberated.)

SOUTH KONA.

No. 1. Oct. 31, 1914—At Kalahiki, one and one-half miles south from Hookena Church on main road. Field scarce of ber-

ries. Caught nine specimens (*Diachasma tryoni*, all males). Parasites plentiful.

No. 2. Oct. 31, 1914—At Hookena, opposite church on main road. Berries plentiful in this field. Saw many parasites. Caught six specimens (*Diachasma*, 4 males, 2 females).

Special. Oct. 28, 1914—At Honaunau, opposite Honaunau store on main road. In this field, in which berries were plentiful, six specimens of both species (2 *Opius* and 4 *Diachasma*, males) were taken by W. M. Giffard, being the first taken during the period of investigation, whilst Dr. Back was gathering berries from a field one mile mauka of the store, where the original *Diachasma* were liberated in June, 1913. Large numbers of parasites seen in this makai field by W. M. Giffard.

No. 3. October 29, 1914—At Honaunau, one-half mile mauka Honaunau store. On this day Dr. Back took seven specimens while collecting berries (4 *Opius*, 2 males and 2 females, and 3 *Diachasma*, males).

No. 4. Oct. 29, 1914—One-half way between Honaunau and Kahaloa, in coffee field opposite new Bishop Estate road junction with main road. Caught 5 specimens (4 *Opius* and 1 *Diachasma*, all males).

No. 5. Oct. 29, 1914—At Kahaloa near Michado store. Berries and parasites plentiful. Caught 10 specimens (all *Opius*, 2 females and 8 males).

No. 6. Oct. 29, 1914—At Kealakekua, opposite Capt. Cook Coffee Mill. Berries fairly plentiful, with many parasites. Caught 7 specimens (5 *Opius*, 4 males, 1 female, and 2 *Diachasma*, 1 male, 1 female).

No. 7. Oct. 28, 1914—On makai road to Napoopoo on land of Kahaloa. In field opposite schoolhouse. Berries not plentiful. Took 2 specimens *Opius*, both females.

No. 8. Oct. 28, 1914—On same road in field opposite papaia grove. Berries not plentiful. (Took 2 *Opius*, males, and 1 *Diachasma*, male).

No. 9. Oct. 28, 1914—On same road one-fourth mile nearer Paris Ranch house. Took 1 specimen *Opius*, male. Berries not plentiful.

N.B.—Parasites evidently scarcer in fields along lower Kealakekua or Napoopoo road than mauka, as fewer were seen.

NORTH KONA.

No. 10. Oct. 30, 1914—At Kainaliu opposite Niwashta grocery store, about two miles north from Miss Paris', took 3 parasites, all *Opius*, 2 females and 1 male). Saw numbers of parasites. Coffee berries plentiful.

No. 11. Oct. 30, 1914—At Honalu, about four miles north from Miss Paris'. Took 2 parasites (both *Opius*, 1 female, 1 male). Saw a few others, but berries not plentiful.

No. 12. Oct. 30, 1914—At Keauhou, about three-quarters of a mile south of Kailua road junction. Took 6 parasites (all *Opius*, 5 males, 1 female). Saw numbers.

No. 13. Oct. 30, 1914—At Kahaluu (Bishop Estate land), in Oka's coffee field, about two miles south of Holualoa. Took 12 parasites (all *Opius*, 11 males, 1 female). Saw large numbers. Berries not very plentiful.

No. 14. Oct. 30, 1914—Lanihau, in field opposite store of Nakahara, about three miles north of Holualoa post office. Took 5 specimens (all *Opius*, males). Both berries and parasites plentiful.

No. 15. Oct. 30, 1914—At Holualoa, in field of Hyashihara, where a second tent containing *Opius humilis* were liberated, I took 1 *Opius*, female, and a small Braconid sp. The same conditions prevailed in this field as in that of Kimura.

No. 16. Oct. 30, 1914—At Holualoa, in fields of Kimura, where a tent containing original *Opius humilis* parasites were liberated. In field makai of Yokohama store on main road I saw no *Opius* at all, but Dr. Back says he saw two. Coffee berries were scarce, crop having been picked. On same land mauka of road I took 1 specimen (*Opius*, female), but there was likewise a scarcity of berries.

No. 17. Oct. 30, 1914—At Kalaloe, about 2½ or 3 miles north from third junction of road to Kailua beyond Honokohau. Took 12 specimens (6 *Opius*, 2 males, 4 females, and 6 *Diachasma*, 3 males, 3 females). Coffee in this small field was wild, overgrown and uncultivated, with berries only fairly plentiful. Saw many parasites.

RECAPITULATION.

From Kealakekua to and
beyond Honokohau.

NORTH KONA.

Opius. *Diachasma.*

3 6

2

6

12

5

1

1

6

—

36

—

6

15 Miles.

From Kealakekua to and
beyond Hookena.

SOUTH KONA.

Opius. *Diachasma.*

2

9

4

6

4

4

10

3

5

1

2

2

2

1

1

—

30

—

26

12 Miles.

W. M. GIFFARD.

Honolulu, November 10, 1914.

A REVISED LIST OF HAWAIIAN VARIETAL NAMES
FOR KALO.

By VAUGHAN MACCAUGHEY and JOSEPH S. EMERSON.

Since the publication of a series of articles in the *Hawaiian Forester* concerning the kalo in Hawaii, a number of varietal names have been added to the list, and certain revisions found desirable in names already published. The revised list follows:

A'a	Eulu
Aapu	Eulu keokeo
Aapu keokeo	Eulu kohu uwauwahi
Aapu lenalena	Ha'akea
Aapu eleele	Haawikea
Aapu lehua	Haehae
Aapu ulaula	Haehae eleele
Ahakea	Haehae keokoa
Ahapii-piialii	Haehae ulaula
Ahé	Haloa
Ahé eleele	Ha'o
Ahé lenalena	Ha'o eleele
Ahé ulaula	Ha'okea
Ai mahahá	Ha'okea haulaula
Akiahiale	Ha'okea hauliuli
Akoki	Ha'okea keokeo
Akole ka uula	Hapu'u
Ala	Hapu'u kea hapu'u keokeo
Aneli'i	Hapu'u eleele
Anunu	Hapu'u lenalena
Api'i	Hapu'u ulaula
Api'i kea	Hapu'u nukea or kukea
Api'ipi'i	Hapu'upu'u
Api'i ulaula	He'e
Apo	Heiliá
Apowai	Hekili
Apowale	Hele mauna
Apuwai	Iiwa
Apuwai keokeo, apuwai kea	Iioene
Apuwai lenalena	Hokeo
Apuwai eleele	Hoole na wao
Apuwai ulaula	Hualani
Auau leo nui	Hua moa
Aweoweo	Huli pu loa
Aweuwen	Ieie ilia
Eele	Ieie
Eleele	Iheiheilie
Eleele naioca	Ii
Elepaio	Ipu o lono

Ipu o lono keokeo	Lau loa ulaula
Ipu o lono ulaula	Lau nui
Ka-i	Lehua
Ka-i auetuweu	Lehua aola
Ka-i eleele	Lehua eleele
Ka-i kea, ka-i keokeo	Lehua ha uliuli
Ka-i koi	Lehua keokeo
Kainele ueue	Lehua ku i ka wao
Kalalama makahi	Lehua lenalena
Kalalau	Lehua ulaula
Kalani pili	Lehua oni'oni'o
Kamau	Lele
Kaneli'i	Leo
Kani'o	Lili lili moleno eleele
Kapalili	Lili lili molena keokeo
Ka puu konane	Liko lehua
Kumú welowelolá	Lili lehua
Kiki'i	Loha
Kili oopu	Lola
Kupala	Manahá
Kawale uaua	Manaha keokeo
Kawelo	Mahahá ulaula
Koa'e	Nahai
Koa'e keokeo	Mahakeo
Koa'e eleele	Mai'i
Koa'e ulaula	Maka lole
Kohiku	Maka opio
Kooka	Maka ua
Kukai iole	Maka lole
Kumaka'u	Maka opio
Kumú	Maka ua
Kumú kea	Makea
Kumú keokeo	Makohi
Kumú poni	Makoko
Kumú ulaula	Makole
Kuoho	Makuku
Laho loa	Makaweo
La-i o kona	Maii'i
Lau ape	Manane
Lau kapalili	Mamanu
Lau kona	Manauea
Lau lele	Mana
Lau loa	Mana eleele
Lau loa ha eleele	Mana ha ulaula
Lau loa ha keokeo	Mana hua
Lau loa ha uliuli	Mana iea
Lau loa manini	Mana kea or keokeo
Lau loa oni'oni'o	Mana lenalena

Mana melemele	Owau
Mana pipika	Owene
Mana ulaula	Owene eleele
Mana ulu	Owene keokeo
Mana wai	Owene lenalena
Mana wea	Owene melemele
Manini	Owene ulaula
Manini ha kikokiko	Pa'akai
Manini kakau	Pa'akai mikomiko
Manini lau kikokiko	Pala palaha
Manini ula	Palaha
Maninini	Palai'i
Manuia	Palai'i eleele
Manulele	Palai'i kea or keokeo
Maua melemele	Palai'i poni
Maua ulu	Palai'i ulaula
Mimi iole	Pala kea or kaokea
Moa	Palili ulaula
Mohihi	Pana
Moi	Papa kole ka waa
Mokihana	Papa kole koa'e
Mokohi makohi	Papa pueo
Naio	Paua
Naioea	Pa-u o hi'iaka
Naioea keokeo	Pe'u
Naioea eleele	Pelu haele
Naioea lehua	Pia
Naioea ulaula	Piapia
Na kalo aola o kalalau	Pihalale
Na kalo i kue	Pi'iali'i
Nana i puhene na kalo	Pi'iali'i eleele
Neenee	Pi'iali'i keko
Nio	Pi'iali'i keokeo
Nohu	Pi'iali'i melemele
Ohe	Pi'iali'i ulaula
Ohe kea	Piko
Ohe ulaula	Piko eleele
Ohi'a	Piko hao
Ohuehue	Piko kea
O ka he'e ko kai	Piko nui
Olaa loa	Piko a wakea
Olena	Piko uaua
Oopukai	Pohina
Oopu	Poni
Opae ula	Poni eleele
Opukai	Poni kea
Opule	Poni ulaula
Owale	Poni uliuli

Popolo	Ula nui
Pueo	Ulaia
Pueo ha lenalena	Ulei
Pueo keokeo	Uli
Puhi	Umiumi
Pu'u	Uwauwahi
Pu'u konane	Wa'e
Puwalu or pualu	Waianae
Uahi a pele	Waianuenue
Uahi a pele ulaula	Welehu
Uahi oki	Welowelo la
Uaua piko	Wehewa or wehiwa
Ualehu	Wewehiwa
Ula mau	Wia

Wireless telegraphy is being used in Canada in reporting on forest fires.

As many as 72 different kinds of wood are used in the manufacture of umbrella handles, canes and whips in this country.

Authentic records show that cinders, from a forest fire in the treetops in northern Washington this fall, were carried a distance of twenty miles.

The Philippine bureau of forestry has recently invited bids for the cutting of nearly 300,000 acres of choice timberland on the public forests on the Island of Luzon.

Officers of the Akanogan national forest in the State of Washington are installing powerful signal lanterns for night use in reporting forest fires from lookout peaks.

According to the latest available figures, Pennsylvania stands fifth in the production of wood pulp and is second to West Virginia in the amount of slabs and other sawmill waste used for pulp; Maine stands third.

California yew, which grows on the national forests of that State, is finding some use in present-day archery practice. Its qualities closely resemble those of the old-world yew which made the English long-bow famous in medieval times.

The Supreme Court of Pennsylvania has decided that the amount of damage collectable on growing timber set on fire through negligence is not only the value of the wood destroyed, but also the injury to the property as a whole through the destruction of the young growth.

It is said that the first sawmill in the United States was at Jamestown, from which sawed boards were exported in June, 1607. A water-power sawmill was in use in 1625 near the present site of Richmond.

The better wood engravings are made almost exclusively of boxwood, and the large blocks are made of small pieces glued together. The engraving is done across the end of the grain. Japanese wood prints, on the other hand, are made on lengthwise sections of cherry wood parallel to the grain.

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A complete list of the publications of the Board available for distribution (together with the titles of certain issues now out of print) is to be found on the cover of the last biennial report.

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The United States Geological Survey topographic map of Kauai is also on sale, and copies will be mailed on receipt of 50 cents.

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This division will also make ditch seepage losses and utilization investigations when the actual cost of the labor, materials, subsistence, transportation, etc., of such investigations is paid by those benefited.

G. K. LARRISON,
Superintendent of Hydrography.

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To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent.

THE HAWAIIAN FORESTER AGRICULTURIST

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No. 12

Naphthalene as an insecticide has its virtues set forth in an article elsewhere, taken from the Agricultural News, of the West Indies. It would appear to be worth trying, in field and house, as well as on animals afflicted with pests.

Mr. Fullaway's succinct report of his expedition to Africa and its results, in this number, adds to the encouragement of success in the natural control of the fruit fly and other pests of plants and animals. That the parasites he has procured are the right ones for the work required seems assured, and that they will easily become acclimated here appears settled from the way in which other species introduced by Prof. Silvestri have thrived and multiplied.

Anxiety is being felt, at this writing, about Mr. J. C. Bridwell, assistant superintendent of entomology, from whom no word has been received since Mr. Fullaway parted from him in Africa some months ago. He remained behind to breed fruit fly parasites, as a precaution against the eventuality of loss of those taken out of that country by his colleague. At the first alarm given relative to his silence, it was hoped that the worst was the detention of his correspondence by war conditions. As time passes, however, fears on his account increase.

Intelligent and modern forestry, such as has been conducted in Hawaii for eight or ten years past, may well prove the solution of the difficult financial problems of this Territory and its municipal subdivisions. Revenue from public land leases will gradually diminish to the vanishing point as the available domain becomes homesteaded, and, although this process may increase the taxable value of the land, the demands upon the revenue contingent on development and progress will constantly grow larger. There must be a limit to property and other special taxes to mark the dividing line between real prosperity and the article heavily discounted by the exactions of "Caesar," and, in the case of income taxes, with the Federal now added to the Territorial meas-

ure, that limit has undoubtedly been reached. Other countries—yes, and even municipal bodies politic—have proved that forests may be made to carry a large part, if not the entire burden of local government. Where trees have such rapid growth as they have in Hawaii, the utilization of forests for revenue is something that can be accomplished well within a generation. Since the fodder value of the algaroba bean has been thoroughly demonstrated, although yet only beginning to be developed, that particular tree of itself, with its marvelously quick growth, ought to be made as lucrative for revenue as mines of precious metals.

If legislation is needed to enforce the reasonable precautions against the recrudescence of bovine tuberculosis, where it has once been brought under effective control, which the Territorial veterinarian urges, then the coming session of the Legislature ought not be allowed to pass without enacting the requisite measures. Nothing short of compulsory destruction of condemned animals and thorough disinfection of the buildings and pastures that have harbored them should be the law of the land. No country has exceeded this Territory in the completeness with which dairy herds have been purged of tubercularly-infected cattle, or in the economy with which that result has been secured, yet, according to Dr. Norgaard, the task must wearisomely be repeated unless the sources of infection be absolutely eliminated. That means to this end be taken the Forester would urge as earnestly as it has the enforcement of the provisions for cleanliness in dairies, slackness in which respect the veterinarian has exposed as nullifying in great measure the protection milk consumers have received from the eradication of consumptive cows from dairy herds.

AGRICULTURAL COÖPERATION IN AUSTRALIA.

From a serial article running in the *Journal of Agriculture*, Victoria, by P. J. Carroll, senior inspector of dairy produce, the following extracts are taken:

"A movement was begun about the middle of the year 1900 amongst a number of coöperative butter factories to form a central association, the headquarters of which were to be in the city. The objects of this association were to receive and dispose of the produce of the factories, and undertake all the duties previously carried out by private agents.

"This was the first purely coöperative distributing company in Australia.

"At the time operations were commenced the paid-up capital of the company (The Victorian Butter Factories Coöperative Company, Limited) was £1,490. It is claimed that enormous savings have been effected in the cost of marketing the produce, and that

the shareholders are enabled to obtain legitimate prices for their output. One substantial saving, however, resulted in the reduction of the agents' commission by 1 per cent. The company made considerable progress, and at the end of six years extended its functions to the manufacture of butter-boxes and the business of freezing. The wisdom of the latter step was always regarded as questionable, seeing that the Government had previously entered into the work of freezing, handling and exporting perishable goods on a practically coöperative basis—that is to say, the Government did not lay itself out to make any profit on the undertaking. This company has now a paid-up capital of £8,000, and a reserve fund of £4,500, and £17,000 has been invested in freezing works and box factory. The turnover of the company since its inception has been £4,500,000, and the profits earned £38,250.

"About 1904 an impetus was given to the further extension of the principle of federating the coöperative butter factory companies by some disclosures made before a Royal Commission on the Butter Trade, which had sat some time previously. The Western District Factories' Coöperative Produce Company, Limited, which embraced most of the butter factories in the Western District of the State, was brought into existence. The chief objects for which the company was established are stated in the memorandum of association as follows: 'To buy, sell, export and distribute all kinds of dairy produce, bacon, poultry, eggs, honey, and any farm, dairy, and garden produce; to purchase, manufacture, and sell all farm and dairy requisites, including implements and machinery.

" 'The shares shall be allotted to and held only by butter, cheese or bacon companies.'

"The original issue of shares was 900 at £55 each, and the sum of £1,690 was paid up in money.

"The turnover of the company since 1904 amounts to £5,344,972. The profit is, approximately, £50,000, of which £12,500 has been expended in an extensive butter-box factory, where the whole of the boxes required for this group of butter factories is manufactured.

"There still remained a considerable area of the State, in the southeastern portion, known as Gippsland, which had not embraced the system of coöperative marketing. In 1905, however, a company consisting of thirty coöperative butter factories was formed for the purpose of dealing with the distribution of the output from these factories principally. The business of this company at its inception was confined to the sale of butter, cheese, eggs and bacon. After five years' experience it was decided to extend the sphere of operations to all kinds of farm produce.

"The original capital of the company, like its predecessors, was on a very limited scale, and for the first three years the sum of £867 represented the full amount paid up. Since that time, how-

ever, the capital has been increased to £21,000, and individual agriculturists and dairy farmers have been admitted as shareholders. During the eight years of this company's existence the total sales amounted to £3,757,000, resulting in a profit of £31,500. The sum of £25,000 has been paid in bonuses to producers, £1,655 in dividends, and £3,600 stands at reserve. In conjunction with this company there is also a large factory for the manufacture of butter boxes.

"Victorian farmers are becoming more critical regarding the methods of the middlemen, and are realizing the value of organization for their own protection.

"That the principal of coöperation is sound is fully emphasized in the illustrations already quoted. In the manufacturing and preparation of produce, and to raise the standard of such produce, the combined effort, if wisely directed, is *par excellence*. When applied to the purchase of stores and requirements for the farm and household, it should prove economical, but the ideal form of coöperation is the one that embraces both producers and consumers.

"Coöperative marketing and distributing societies, if not carefully managed and controlled, have a tendency to develop into profit-earning institutions, and thus become ordinary trading concerns. The idea should not be to make or hoard profits or accumulate capital, for this leads to extravagance and speculation. Rather should the management be actuated with the primary and simple idea of combining resources for the economical disposal and purchase of produce, and to educate its members in the best methods of producing, manufacturing and preparing their products for market."

It is stated that "farmers in various districts of the state are further organizing for the purpose of making savings in the cost of distribution of other products, such as potatoes, onions, cereals, hay, chaff, etc., and for the purchase of bran, pollard, seeds, etc." Several pages are devoted to the relation of various coöperative movements, also to the government policy of encouraging the taking up of homesteads, which includes advances on moderate interest for houses, etc., and in conclusion appears the following statement of results:

"Irrigation schemes constructed by the states run into many millions of pounds sterling. The state has adopted the policy of purchasing large areas of land commanded by these schemes, and subdividing them for intensive cultivation, and the settlement of those areas will mean a large increase in population. The management and supervision of these irrigation enterprises have been vested in a body consisting of three commissioners, and recently the control of irrigable lands has been transferred to this body.

"These manifold activities of the states, which are truly co-operative in character, supply the capital for the purchase of land,

stock and irrigation facilities. In other countries this becomes part of the functions of the Coöperative Banks or Credit Societies. Under such conditions, however, the initial capital must come from the settler himself, consequently he is impoverished to that extent, and not so well equipped to fight the battle which has to be undertaken before success can be achieved. The system in Australia is, therefore, in advance of that in other countries, and, by force of example, is fostering and promoting the true coöperative spirit. The progress of agriculture under such encouraging and healthy conditions is fully assured, and that the industry is going ahead by leaps and bounds is adequately attested by the following cogent facts:

" Production of butter in 1907.....	156,380,670 lbs.
" " " 1911.....	211,577,745 "
Increase, 35.33 per cent.	
Production of cheese in 1907.....	13,383,563 lbs.
" " " 1911.....	15,886,712 "
Increase, 18.70 per cent.	
Production of condensed milk, 1907.....	9,643,551 lbs.
" " " 1911.....	22,983,707 "
Increase, 138.34 per cent.	
Production of bacon in 1907.....	40,719,181 lbs.
" " " 1911.....	52,264,652 "
Increase, 28.32 per cent.	
Production of wheat in 1906-07.....	66,421,359 bushels
" " " 1910-11.....	95,111,983 "
Increase, 43.19 per cent."	

FRUIT FLY CONTROL.

REPORT OF FIELD ENTOMOLOGIST FULLAWAY ON HIS EXPEDITION TO AFRICA.

E. M. Ehrhorn, Esq., Superintendent of Entomology, Honolulu, T. H.

Dear Sir:—Permit me to report my arrival from Teneriffe, Canary Islands, by way of Cuba and the Southern States, on October 27, 1914, with the following parasites which were collected in Nigeria, West Africa, in August, and taken to the Canaries for multiplication in our species of fruit fly *Ceratitis capitata*, viz:

- 300 females and males *Tetrastichus giffardi*;
- 12 females and 19 males *Diachasma fullawayi*(?);
- 4 females and 22 males *Opius*, species undetermined;
- 10 females and 2 males *Spalangia*, species undetermined;
- 1 *Eucoila* undetermined.

Also from Teneriffe 3 specimens of a metallic *Chalcid*, species undetermined; also two vials containing *Tetrastichus*—parasitized pupae of the Mediterranean fruit fly (*Ceratitis capitata*), one with 23 pupae out of which 4 fruit flies had emerged, the other containing 9 pupae; also *Tetrastichus*—parasitized maggots in

three jars of fruit. This material represented breeding work accomplished en route.

The following morning, October 28th, I assumed charge of the insectary and commenced the multiplication of all these new species with the material which had been prepared in advance by you. The work has been going on continually since then and we are multiplying the species as rapidly as the insectary conditions permit. There is no doubt about the multiplication of *Tetrastichus* in large numbers as the new generation of parasites developing within the pupae of the fruit fly can be seen in a living condition through the pupal skin. The multiplication of the two Braconid species may be attended with some difficulty, as in Teneriffe I was bothered with the old difficulty of faulty mating.

The *Tetrastichus* is the species which Silvestri discovered in West Africa but lost on the way home. It was considered by him as one of the most important parasites of *Ceratitis capitata* in West Africa, and its introduction is especially recommended in his recent report. The two Braconids are similar in kind to the species now so successfully multiplying and spreading in the Kona district of Hawaii and about Honolulu, and ought to be very valuable in the control of the fruit fly. Both of them are larger than *Opius humilis* and have much longer ovipositors.

I regret that I cannot give positive information just now in regard to their ultimate establishment here, but the work as far as it has gone gives every promise of success.

Yours very truly,

DAVID T. FULLAWAY,

Field Entomologist Board of Agriculture and Forestry.

NOTE:—Since the above report was written I have succeeded with the multiplication of one of the above species of Braconids in the insectary.

D. T. F.

The timber industry represents 37 per cent of the annual production of wealth in British Columbia.

In addition to his own fire detective system, the supervisor of the Palisade national forest, Idaho, was notified of each fire by from five to ten different local settlers, who thus showed their co-operation in working for fire suppression.

The Uinta mountains of Utah, included within the Wasatch, Uinta, and Ashley national forests, should become a favorite recreation region, because of the many small lakes within depressions scooped out by glacial drifts. Seventy such lakes can be counted from Reid's peak, and one particular township, 36 miles square, contains more than a hundred.

DIVISION OF ANIMAL INDUSTRY.

Honolulu, October 31, 1914.

The Board of Commissioners of Agriculture and Forestry.

Gentlemen:—That bovine tuberculosis can be eradicated by the means and methods employed by this Board during the past four years seems now to have been fully demonstrated, but whether this aim is to be attained in the Territory of Hawaii within a reasonable space of time will depend entirely upon the compliance of the dairymen and cattle owners with certain requirements which the last general tuberculin test, now more than half finished, have emphasized as necessary to success.

The most important of these requirements is the immediate destruction of all reacting animals or else their absolute segregation. But this latter can no longer be accepted as accomplished so long as the reactors remain anywhere in the neighborhood of the healthy animals.

While none of the standard textbooks or current scientific periodicals as yet classify tuberculosis, whether human or bovine, as an extremely contagious disease, but still consider it as a mildly infectious disease which can be guarded against by ordinary hygienic and sanitary measures, so long as these are conscientiously carried out, *our* experience with bovine tuberculosis has now fully demonstrated that unless we classify and deal with it as an air-borne contagious disease, capable of being transmitted by wind and dust over distances far in excess of those hitherto accepted, we shall never be able to eradicate it here; and the only economic and effective measure known to live stock sanitarians in dealing with an air-borne contagious disease is destruction followed by disinfection.

This apparently radical statement is however based upon incontrovertible facts which, with the progress of the bovine tuberculosis control work, have asserted themselves more and more until finally demonstrated beyond doubt by the results. And these results show *that the disease persists only on the premises where reacting animals are retained* and in spite of any precautions adopted so far.

It is not the desire in this report to refer to individual cases and without such reference no actual proof of the above contention can be produced, but the statement is made for the purpose only of spurring on those dairymen who still adhere to this practice, to desist before their neighbors and colleagues in the dairy business, and who at great expense have cleaned their herds of tubercular animals, rise up and insist that the man who is harboring the infection by retaining his reactors is deliberately injuring the dairy industry in general and jeopardizing the dearly bought advantages of his neighbor as well as public health. For

it must be admitted that there is not a dairyman in the district who has not signified his willingness to "do the right thing" to co-operate with this Board in its effort to eradicate bovine tuberculosis—only there are some who want to do it in their own way and at their own time and convenience. And in the meantime we see fresh cases of infection developing in these "retained reactor" herds at an amazing rate, the number of reactors doubling and even trebling between two tests, only a few months apart.

Segregation by wire fence, whether single or double and whether twenty or fifty feet apart, can no longer be accepted as safe, at least not in this climate where the infected manure dries quickly, is trampled to dust and scattered by the winds at least during 75 per cent of the days of the year.

Take as an example a case encountered during the past month—a lady owning three dairy cows all of which have been raised on the premises and all of which had passed the tuberculin test four times, the last time in April of this year. These cows were sent to a pasture for a period of about three months, while dry, there being supposedly no reactors or untested animals in the same enclosure. A few months after coming home fresh one of the cows developed a suspicious cough and the owner requested that the animals be retested. Two of them reacted and both were found upon post mortem examination to exhibit fresh tubercular lesions in cervical and thoracic lymph glands and one of them, the coughing one, in the lung tissue also. That these animals had come in contact with tubercular cattle during their absence from home cannot be doubted, but where and how the infection reached them could not be determined after the lapse of nearly half a year. But it is safe to conclude that unless retained reactors or untested tubercular animals were in the neighborhood, or else that the infection was carried to them by either wind-blown dust or drinking water, they certainly could not have contracted the disease.

A far stronger proof, however, of the danger of spreading the disease by means of the retained reactor will be found in the following figures: An aggregate of 3000 tuberculin tests have been made during the present August to November test. About 500 of these injections were made on premises where previous reactors have been retained for shorter or longer periods before being slaughtered. Of this number not less than 39 reacted, including a number of calves and heifers. Among the remaining 2500 head, all on premises where reactors are destroyed without delay, only eleven reactors were found, or 0.44 of one per cent as compared to nearly eight per cent. If this does not prove the retained reactor to be an expensive luxury, it at least demonstrates the ease with which the infection is spread, as all ordinary precautions against this are supposed to have been taken in every case. When it is further considered that beef prices at the present time are very high—an ordinary milk cow in fairly

good condition bringing from \$50 to \$60 on the block if passed for beef (and hardly any fail to pass now that practically all the bad cases have been eliminated), then it is difficult to understand how any dairyman can see it to his profit to risk the infection of one or more cows from each reactor he retains on his premises, unless he continues to utilize the milk from his reactors in boiled and pasteurized condition, which again can rarely be done to advantage when the risk is considered. The Dairymen's Association, we are assured, will not accept the milk from reacting cows for treatment in their purifying plant as this would necessarily mean admixture with the milk from the clean herds, besides which the method would be illegal under the existing milk ordinance. Nor would such milk, if the facts were known, find a market so long as milk from clean herds is obtainable. There consequently remains only the one object of fattening the reactor before sending it to the butcher, and with the possibility of the carcass being condemned this also would seem of doubtful value, as a consumptive animal is not given to putting on flesh rapidly.

In view of these facts it is therefore to be hoped that the dairymen who still have reactors in their possession will take advantage of the present great demand for beef and consequent high prices, prices which are fifty to one hundred per cent higher than they were a year ago, and at the same time make an earnest effort at ridding their stables and premises of the tuberculous infection; or, in other words, have every dairy animal over four months old tested, every reactor butchered, all stables, mangers and stanchions scraped and whitewashed, and all yards, sewers, drains and cesspools scraped and cleaned until, so far as possible, all of the old infected manure has been removed.

With bovine tuberculosis at a hitherto unknown minimum the present must be considered a very favorable time for a concerted effort at complete eradication, so far as this district is concerned, and will undoubtedly cost less and prove of quicker advantage to the dairymen than at any previous time and possibly at any subsequent time and will, with the present great efforts at combating the great white plague, no doubt be appreciated by the local health authorities as well as by the public in general.

An article on the subject of bovine tuberculosis in its relation to public health, and especially with regard to its transmission to children, is now being prepared and will be delivered at the annual meeting of the Medical Society of Hawaii on Saturday, November 21. The object of this paper is to enlist the coöperation of the medical profession in educating the public in the knowledge and appreciation of clean and wholesome milk.

Very respectfully,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, October 31, 1914.

Dr. V. A. Norgaard, Chief of Division of Animal Industry.

Sir:—I beg to submit the following report for the month of October, 1914:

Tuberculosis Control.

The following dairy cattle have been tested during the past month:

	T.	P.	C
F. M. Swanzy	1	1	0
O. R. & L. Company.....	271	270	1
do do	328	328	0
do do	257	257	0
do do	5	5	0
F. S. Lyman	29	29	0
Waialea Industrial School	55	55	0
C. M. Cooke	7	7	0
Mrs. S. J. Grace.....	3	1	2
P. M. Pond	315	314	1

From the above it will be seen that a total of 1571 head of dairy cattle were tested, out of which number 1567 were passed and tagged and 4 were condemned and branded.

A post mortem examination was made on the two cows condemned at Mrs. Grace's dairy, the results of which revealed pulmonary tuberculosis in each case, the diaphragmatic lobes of the lungs being filled with masses of cheesy tuberculous material, many of the bronchi being filled with a considerable quantity of phlegm which during the life of the animals was being constantly coughed up and the infectious material being disseminated throughout the dairy.

As the animals had been raised on the place from the time they were very small calves and had repeatedly passed the tuberculin test up to eight months ago, the only way they could possibly get the infection was from the valley pasture in which they had been kept when dry. This emphasizes the importance of obtaining definite knowledge regarding the condition of the pasture and the health of the animals which may be contained therein before exposing stock known to be healthy to any infection which may be present.

It will be seen from the above list that 861 head of cattle were tested for the Railway ranch out of which number only one old cow was condemned, which is a most excellent showing and points to the rapid elimination of the disease on this ranch.

Importation of Live Stock.

Manoa, San Francisco: 10 crates poultry.

Mongolia, Orient: 1 crate Japanese games.

Matsonia, San Francisco: 28 crates poultry; 1 crate rabbits,
W. F. & Company.

Shiyo Maru, Orient: 1 crate Japanese games.

Sierra, San Francisco: 1 crate poultry, M. Dellan.

Enterprise, San Francisco: 11 crates poultry; 78 hogs, 1 Holstein bull, 39 mules, Schuman Carriage Co.; 6 crates (12) Angora goats, Q. A. Robinson.

Hyades, Seattle: 2 Angus bulls, Honolulu Ranch; 6 Angus bulls, Maui Agricultural Co.

Wilhelmina, San Francisco: 1 crate Belgian hares, Z. K. Myers; 18 crates poultry.

Mongolia, San Francisco: 1 dog, P. L. McIltree.

Respectfully submitted,

L. N. CASE,
Assistant Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

Honolulu, October 31, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report for the work performed by the Division of Entomology for the month of October, 1914, as follows:

During the month 36 vessels arrived at the port of Honolulu of which 16 carried vegetable matter.

<i>Disposal.</i>	<i>Lots.</i>	<i>Parcels.</i>
Passed as free from pests.....	1,145	30,441
Fumigated	1	2
Burned	27	27
Returned to shipper	1	1
Total inspected	1,174	30,471

Of these shipments 30,228 packages arrived as freight, 121 packages as baggage of passengers and immigrants and 122 packages through the postoffice.

RICE AND BEAN SHIPMENTS.

During the month 40,674 bags of rice and 2,113 bags of beans arrived from Japan which after careful inspection were found free from pests and were passed for delivery.

PESTS INTERCEPTED.

Twenty-six packages of fruit and one package of vegetables were found in the baggage of passengers and immigrants from foreign countries. All this material was seized and destroyed by burning. A species of five-leafed pine from Japan in the baggage of a passenger was sent back on board of the steamer under a ruling of the Federal Horticultural Board, as all such pine trees are prohibited from landing in the United States or its territories on account of the white pine blister rust (*Peridermium strobi*), a very serious disease of pine trees. Two European Bay trees were fumigated on account of being infested with the soft scale (*Coccus hesperidum*).

Tucked away among some vegetable seeds and herbs from Portugal was a lonely apple which we seized and destroyed. It is just in such material that some pest could come into the Territory. Fortunately there exists a thorough coöperation between the postoffice authorities and our department and very little escapes our inspection.

A small quantity of beans, peas and corn was fumigated for a local firm on account of weevil infestation.

BENEFICIAL INSECTS.

During the month 7200 parasites were liberated from the breedings in the insectary, consisting of the following: For horn and house fly, 1600 *African horn fly* parasites, 2000 *Philippine Spalangia*, 2000 *Philippine Pteromalids*. For fruit fly, 250 *Galesus silvestrii* and 750 *Opius humilis*.

On October 9 I received a shipment of parasites from Mr. Fred Muir, consisting of one cage with many living *Tiphia* species, the natural enemy of *Anomala orientalis* and the Japanese beetle, so-called. This shipment was delivered by me to Mr. H. O. Swezey of the H. S. P. A. and he liberated 60 specimens at Aiea. A few specimens were kept for indoor breeding. All the soil containing the parasites was destroyed by burning. On October 27 I received two cages from Mr. Muir which I personally delivered to Mr. Swezey at the H. S. P. A. station. Mr. Swezey has liberated 14 parasites from one cage and the other cage is supposed to contain parasites in the pupal stage, so that it may take a few weeks for the adults to issue. All these shipments are sent to me for the H. S. P. A., as it avoids delay and safe delivery by using this system. Every care is taken with the material, which is under quarantine regulations. From the second sending quite a number of parasites have been kept for indoor breeding.

On October 27 Mr. D. T. Fullaway returned from Teneriffe with a good supply of parasites for the fruit fly. Having received a cable from him requesting me to have on hand infested fruits, etc., I got everything necessary in good shape and he had no difficulty in finding sufficient material for his work of propagating.

He has taken charge of the insectary and breeding work and has submitted a short report.

HILO INSPECTION.

Brother M. Newell of Hilo reports the arrival of six steamers and one sailing vessel. Five steamers brought vegetable matter consisting of 303 lots and 5447 packages. Of this number twenty boxes of wormy apples were rejected and returned to shipper. Twenty bags of potatoes and one bag of turnips had to be cleaned before delivery.

INTER-ISLAND INSPECTION.

During the month of October 62 steamers plying between the islands were attended to and the following shipments were inspected and passed:

Plants	83	packages
Taro	673	"
Vegetables	37	"
		<hr/>
Total passed	793	"

The following packages were refused shipment on account of infestation or of having undesirable soil attached to the plants:

Plants	26	packages
Fruit	17	"
		<hr/>
Total refused	43	"

Respectfully submitted,

E. M. EHRLHORN,
Superintendent of Entomology.

Of two million sheep annually grazed in the State of Utah, more than a million are on the national forests, or, including lambs which are fattening for market on the forest ranges, over a million and three-quarters.

Boxmakers in the United States use more than four and a half billion board feet of lumber each year, or more than one-tenth of the entire lumber cut of the country.

DIVISION OF FORESTRY.

Honolulu, October 31, 1914.

Albert Waterhouse, Esq.,
 Acting President and Executive Officer,
 Board of Agriculture and Forestry.

Dear Sir:—The following report gives the principal work done during the month of October, 1914:

NURSERY.

Distribution of Plants.

	In seed boxes.	In boxes trans- planted.	Pot grown	Total.
Sold . . . . .	....	...	310	310
Gratis	2000	200	1013	3213
	<hr/> 2000	<hr/> 200	<hr/> 1323	<hr/> 3523

COLLECTIONS.

Collections on account of plants sold amounted to.....	\$ 7.35
Rent of building, nursery grounds for month of September.	35.00
	<hr/> \$42.35

PLANTATION COMPANIES AND OTHER CORPORATIONS.

The distribution of plants amounted to 8250 in seed boxes and 150 pot grown; total, 8400.

MAKIKI STATION.

The demand for trees from homesteaders and others has every indication of being large and we are using all our efforts to have as good a supply as possible on hand. Arbor Day will also relieve us of large quantities of pot grown trees.

HONOLULU WATERSHED PLANTING.

The work connected with the planting of trees in the neighborhood of Sugar Loaf Hill is progressing satisfactorily. During the month 502 koa and 212 kukui trees were planted. The trees previously planted have all been hoed. The number of trees planted to date amount to 4766 koa and 1048 kukui trees; total, 5814.

MOLOKAI FOREST RESERVE, ANAHOLA, KAUAI.

Mr. Kaina D. Lowell reports that 2500 holes were dug and planted with eugenia (Chinese plum) seed during October and that the seeds were sprouting very well.

PLANTING NAIHIKU BOUNDARY.

Mr. W. A. Anderson is making preparations for planting trees along the forest reserve boundary above Nahiku homesteads and we will ship the trees as soon as he is ready for them.

WAIHOU SPRING FOREST RESERVE PLANTING.

The trees are also ready for the Waihou Spring forest reserve planting, which Mr. L. von Tempsky has agreed to plant.

ADVICE AND ASSISTANCE.

The following gives the number of visits made and advice given to people in and around the city of Honolulu:

Calls in and around city, 6; advice by telephone, 8; advice to people calling at nursery, 5.

Very respectfully,

DAVID HAUGHS,
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

Honolulu, November 7, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the Division of Hydrography during October, 1914, is submitted:

RAINFALL.

The long period of exceptionally heavy rainfall terminated with the heavy storm of September 22-27, and since that time the precipitation on all islands has been about normal. All streams have measured their normal low water flow.

FLOOD DAMAGE.

A visit to the new mauka stream gaging station on windward Kauai early in October showed considerable damage done to the stations on the Waioli, Lumahai and Hanalei rivers. All construction work and equipment were intact, the damage resulting from the stream channels being checked with boulders, gravel and debris. The floods also demonstrated the fact that the intake pipes of all windward stations were too short and that the new station on the North Wailua river has been established too close to the stream, and with the register shelter about four feet too low. This station was not damaged by the recent floods, but previous flood records which have been furnished us since the late flood show that this stream has reached a flood level at least two feet above the present one. For this reason

this station is now being moved back about ten feet and raised four feet. It is anticipated that the clearing of the choked channels of the Waioli, Lumahai and Hanalei, and the extension of all intake pipes will be completed by December 31, 1914.

The flood discharge data obtained should be of great value in determining the size of the bridge openings when new bridges are built to replace those washed out by the flood.

OAHU AND ADMINISTRATION.

The coöperative investigation work being done at the Waipio experimental station progressed favorably. It is anticipated that the work at Waipio will be completed in November, and a series of ditch loss investigations started on various plantations on Oahu. Mr. Kimble also made a number of measurements which will be of value in rating the coöperative stations on the Kahuku and Laie plantations.

Mr. Austin visited three rainfall and 22 stream gaging stations, and made 30 stream and ditch measurements. He also measured the flow from the new U. S. Army artesian well at Fort Shafter and of the Kawaiolena springs near Liliha street, Honolulu. One measurement was made of the discharge from the north portal of the Waiahole tunnel.

KAUAI.

A foot suspension bridge was constructed on the North Wailua river in order that the new station now being established on the East Branch of the North Wailua might be reached in flood.

From October 17 to 25 all of the new stations recently built on windward Kauai at elevations of from 650 to 850 feet above sea level were visited by Mr. Dort, accompanied by the Superintendent of Hydrography. A survey of damage done by the recent floods was made and plans outlined for changes made necessary by information developed during these floods. Mr. Dort visited 8 stream gaging and 4 rain gaging stations. Mr. Horner visited 8 stream gaging and 8 rain gaging stations.

MAUI.

Mr. Bailey, accompanied by the Superintendent of Hydrography, spent October 3 and 4 inspecting work, and on October 5 a reconnaissance was made of two possible storage sites on the headwaters of Maliko gulch in the vicinity of Kailili, at an elevation of about 3200 feet above sea level.

During the balance of the month Mr. Bailey visited 30 stream gaging stations, established 12 permanent bench marks, equipped 10 automatic register stations with interior gage height registering devices, and made 16 stream measurements.

On October 31 he discontinued his temporary headquarters at Wailuku and left for Honolulu where he will act as Acting

Superintendent of Hydrography during the absence of the Superintendent of Hydrography.

KONA, HAWAII, REPORT.

Mr. Kimble spent ten days assembling and preparing data, maps and estimates on this report which will be completed by December 31, 1914.

NOVEMBER PLANS.

Oahu.

Mr. Kimble will continue experimental work on water duty, ditch losses, etc., at the Waipio experimental station. He will also carry on the rating work in connection with the coöperative stations on the Kahuku and Laie plantations.

Kauai.

The new clock register station on the East Branch of the North Wailua river will be completed. The station on the North Wailua river will be raised and moved back to a safer level and location, and if possible the work of clearing the channels of the Waioli, Lumahai and Hanalei of flood debris will be started. At the same time the intake pipes of these stations will be extended.

Maui.

The only work to be done on Maui will be an inspection trip to all automatic register stations.

Hawaii.

Mr. Bailey will probably visit Hawaii to secure discharge data desired by the Territorial Attorney General.

Arrangements have been made by which the Kūilae stream measurement station and all mauka rainfall stations in Kona, Hawaii, will be maintained by private parties who will furnish records to this office.

GENERAL.

Mr. Larrison left for the mainland on November 5 for a conference of district engineers of the U. S. Geological Survey which will be held in Washington, D. C., in December, 1914.

TABULATION.

Island.	Sept. 30.	Estab- lished.	Discon- tinued.	Oct. 31.
Kauai	36	0	0	36
Oahu	50	1	2	49
Maui.	42	0	0	42
Hawaii (Kona)	1	0	0	1
Total	129	1	2	128

Very respectfully,

C. N. BAILEY,
Acting Superintendent of Hydrography.

NAPHTHALENE AS AN INSECTICIDE.

Naphthalene is one of the by-products obtained in the distillation of coal tar. It has been long known as an insect repellent, and some of its uses are very familiar to nearly everyone. It may be of interest, however, to bring together a brief account of several different ways in which it may be employed.

The best known use for naphthalene is for the protection of stored clothing, books, insect collections, and museum specimens. Clothing such as woolen garments, feathers, and furs are protected from moths and beetles by being packed in tight boxes, or securely wrapped in parcels covered with paper, cotton, or linen cloth. Moth balls, naphthalene flakes or crystals, freely used in such boxes or parcels, give good protection, the insects being repelled by the smell of the naphthalene.

Books which are kept in closed bookcases may be protected to a large extent by scattering flaked naphthalene freely on the shelves, behind the books, and on and between the books themselves.

Insect collections should be kept in tight boxes; naphthalene flakes in the bottom of the boxes, or moth balls on pins in the corners of each box, will keep out insects and mites which are destructive to stored insects. Moth balls can be fixed on pins quite easily. An ordinary pin heated in the flame of a lamp or candle can be forced through the moth ball by means of pliers or forceps, and when it cools the naphthalene will set firmly round it.

As a remedy to be used against cockroaches, naphthalene is not so well known. In the *Agricultural News* for September 27, 1913, a note appeared giving an account of good results obtained from the use of a mixture of equal quantities of naphthalene (finely powdered) and boracic acid. This mixture was plentifully sprinkled in places frequented by cockroaches. The insects were greatly reduced in numbers after the second application, which was made after an interval of two weeks.

The use of naphthalene for freeing a house from an infestation of fleas was noted in the *Agricultural News* for May 9, 1914. In this case a new house was seriously infested before being inhabited. Naphthalene to a depth of 2 or 3 inches was put on the floors of one or two rooms, and after twenty-four hours was swept up and put into the other rooms and passages of the house, until all were so treated. The fleas were all killed out.

Naphthalene is also very useful as a dry bath for dogs and cats infested with fleas. The insecticide in a very finely powdered condition, or in the form of flakes, is rubbed into the coats of the dogs or cats, and the fleas are rapidly driven out by it. They fall to the ground in a stupefied condition; if the operation is carried on over a sheet of cloth or strong paper, and the naphthalene is freely used, the fleas are killed by continued contact with it, and it can be taken up and used over and over again.

The naphthalene has no disagreeable or deleterious effect on the animals, and does not leave any disagreeable smell in their coats after the application. Dogs treated with naphthalene in this way remain much freer from fleas than when the control of these insects depends on ordinary washing and "picking."

Naphthalene has recently been used with success in the prevention of insect attack on stored grain. In India (see *Agricultural Journal of India* for January, 1914) an interesting series of experiments was published, which showed that this substance gave a thorough protection to stored maize over a period of thirteen months. The grain was placed in cylindrical bins, about 6 feet deep by 3 feet in diameter, each bin holding about 40 bushels. The charge used was 1 pound per bin, divided into four lots of one-quarter pound each. These were enclosed in bags made of cloth with open texture, and were placed at equal distances from the bottom to the top. The bins were tight, and were tightly covered. At the conclusion of the trials it was found that about one-half of the naphthalene still remained in the bags.

The results were very satisfactory, and indicate that naphthalene used in this way provides effective protection for stored grain.

Naphthalene is very useful in the preparation of emulsions of oil in soap solutions, in making spray mixtures for the control of scale insects.

The peculiar property possessed by this material of bringing about an easy and perfect combination of oil and soap solutions was discovered by Mr. H. H. Cousins some years ago when connected with the Eastern Agricultural College at Wye, England. Mr. Cousins prepared a mixture to which he gave the name Paraph, which was composed of soft soap, naphthalene and kerosene oil. This was successfully used against insect pests on plants; and later, in Jamaica, Mr. Cousins applied it also to the destruction of ticks on cattle, fleas on dogs, and other similar purposes.

Mr. H. Maxwell-Lefroy prepared a mixture of whale-oil soap and Barbados crude oil (*West Indian Bulletin*), applying Mr. Cousins' principle of using naphthalene to bring about the combination of the oil and soap. More recently, Mr. J. C. Moore of St. Lucia has applied the same methods to the preparation called Scalos, which is a mixture of whale oil soap, kerosene and naphthalene.

Naphthalene is sold in Barbados at retail, at the rate of 1s. per pound, and in quantity at 7½d. per pound. In England and the United States the price is, of course, lower, but even at the rate of 7½d. per pound, it is a very cheap material to use for the several purposes mentioned above. It possesses advantages over certain other substances for which it might be used as a substitute, since it is easy to handle, clean, and not dangerous either from being poisonous or highly inflammable or explosive in character.—*Agricultural News*.

FORESTS AND FLOODS.

Under this heading a letter in *Nature* (July 16, 1914) discusses the significant circumstances that tilled soil absorbs more rainfall than earth that has laid untouched. As an experiment, water was poured into soil contained in pots consisting of two series : (a) in which the soil was consolidated, (b) in which the soil was broken up and loose. It was observed that the water entered the soil of the undisturbed pots more slowly than the other, and that the water more quickly passed through the soil in these pots than the other. After having taken necessary precautions that the soil had been entirely wetted throughout, the pots were weighed and showed that the disturbed soil held a much greater amount of water than the consolidated soil.

It may be asked: What connection has this with forests and floods? In the letter under consideration, it is maintained that the soil in which trees are growing is looser than that which is bare; consequently it is in its best condition for absorbing and retaining the rainfall. It is maintained further that the decaying vegetation on the surface under trees has also a beneficial effect, as it absorbs water and acts as a mulch, preventing drying.

It would seem to us that the conditions obtaining in the pots are not perfectly comparable to the characters of a forest or bare hill-land soil. The presence of a covering of decaying vegetable matter in the forest introduces factors not involved in the pot experiments. The main point brought out, however, is illuminative, and well worth bearing in mind.—*Agricultural News*.

GROUND LIMESTONE.

When discussing the subject of liming, confused ideas are occasionally met with in regard to the question of limestone versus slaked lime or quicklime. Perusal of an article in the *Journal of Agriculture*, of New Zealand (April 20, 1914), will show that all the good effects resulting from the employment of quick or slaked lime on the soil may be produced with greater safety by ground limestone. The effective nature of ground limestone naturally depends to a large extent upon its mechanical condition; the finer the crushing the better the results. Chemically, limestone, like lime, is alkaline, and tends to destroy the sticky nature of soils. It further supplies a base for the formation of nitrates in the soil and liberates potash from the insoluble soil silicates and prevents potash fertilizers from passing into an unavailable condition. Limestone furthermore has a favorable influence on the availability of phosphates in the soil.

In the article referred to, mention is made of the fact that material containing limestone may also contain a high percentage of clay or other so-called impurities. It is quite possible that under

some conditions these impurities are an advantage, as for instance, when limestone is to be added to light soil. As regards the amount that should be applied per acre, experimental work in England and America indicates the reversion to the old-time custom of applying limestone in large rather than in small quantities at a time—by the ton rather than by the hundredweight. Two tons of limestone per acre is said to be the smallest amount that should be tried on an experimental scale at first. It may be noted here that, in the case of very tenacious clays, it may be found advisable to begin with a dressing of quicklime because the action of this substance is more active than that of limestone.

There is a call in New Zealand for more experiments with lime; it is suggested that demonstration plots should be laid down to show the relative efficiency of ground limestone of varying grades of fineness, and therefore of varying cost; to show the effect of varying quantities; varying methods of application; caustic lime in varying forms; the effects of these in combination with phosphates on various crops, and so on. In these as in all other manurial experiments, a number of years will be required before really decisive conclusions can be drawn as to the beneficial effects derived under the various conditions.—*Agricultural News*.

A NEW FIBRE DECORTICATOR.

The advantages of a new machine for scutching sisal, flax, hemp, ramie, hibiscus, jute, banana and other fibres are presented in the Queensland Agricultural Journal for July, 1914. The machine is known on the market as "La Francaise," and it is stated that all information may be obtained from Mons. F. Michotte, 45, Avenue Trudaine, Paris.

The advantages claimed for this machine are very briefly as follows: It is adaptable for all sizes of leaves or stems; it can be set up to work in the field; it is not complicated in construction nor does it require skilled attention; the work performed is said to be perfect, rapid and economical, the leaves and stalks are treated by direct attack, all the decortication is effected in one passage through the machine; the leaves or stalks have not to pass through the beaters several times as is the case with other machines; and a peculiarity of the machine is that no preliminary hand labor is required to remove the leaves, as is often the case in connection with ramie. The motor power is economical.

La Francaise will treat about 2,700 lbs. of dried leaves or stalks and 5,620 lbs. of green in a day of ten hours, producing about 337 lbs. of dry fibre. Consequently it is equal to decorticating in five days the crop of two and a half acres of hemp, representing 27,000 lbs. of stalks or leaves. The price of the machine (at the works) complete is £58 10s.

The world's record for the output of sugar for any one factory is held by Chaparra, in Cuba, which has brought its 1913-14 crop to a close with a production of slightly above 611,000 bags, or 87,300 long tons of sugar, polarizing very close to 96. The Louisiana Planter (August 1, 1914) says that this will most likely stand in no grave danger of being passed for some time to come. As a matter of fact the case just quoted is only one of the several records that have been made in Cuba on the 1914 crop.

A note on the red clay soil of Porto Rico appears in the Monthly Bulletin of Agricultural Intelligence and Plant Diseases for June, 1914. This soil is widely distributed in the island and is characterized by the high percentage of iron and aluminium, the absence of carbonates and its acidity, and deficiency in organic matter. These soils respond to manuring, particularly with lime; but certain areas, which have been continuously under sugar cane, are in a sick condition and respond to neither manuring nor liming. The reason for this is unknown, although an examination of the organic matter of these soils has been carried out by the United States Department of Agriculture.

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FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

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DAVID HAUGHS,
Acting Superintendent of Forestry.

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To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications **SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.**

EDW. M. EHEHORN,
Superintendent.

THE HAWAIIAN FORESTER AGRICULTURIST

VOL. XII.

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No. 1

NEW PRESIDENT OF BOARD.

Mr. Albert Waterhouse has succeeded Mr. W. M. Giffard as President of the Board of Agriculture and Forestry. He has been one of the most active members of the Board for several years past. Mr. Giffard remains a member of the Board of Commissioners.

NEW FORESTRY SUPERINTENDENT.

Mr. C. S. Judd assumed office as Superintendent of Forestry, in succession to Mr. Ralph S. Hosmer, now head of Yale Forest School, early in January. He is also the executive officer of the Board of Agriculture and Forestry. Mr. Judd has had years of experience in the Federal forest service, besides a short term in special forest work in Hawaii between separate engagements on the mainland, and being of Honolulu birth and early education his appointment as head of the Division of Forestry was received with special gratification.

MUNICIPAL MILK INSPECTION.

Mayor Lane, the board of supervisors approving, has declined to coöperate with the board of agriculture and forestry in the work of milk inspection. He has appointed his brother as inspector, instead of Mr. Richard, who has been in the employ of the board of agriculture and forestry since his removal by the former mayor from the position. The mayor has promised that he will see that the inspection is thorough. On the other hand, Dr. Wayson, city and county physician, has taken the ground in a published interview—if correctly quoted—that the municipal dairy inspector has nothing to do with the inspection of milk but only of dairies. Further, he is reported as saying that the inspector is not required to have any technical training, also that the office has existed since 1911. Surely the city and county physician had never taken the trouble to read,

much less study, the milk ordinance before giving expression to such views. Taking his last mentioned statement first, the fact is that there has been a municipal milk inspector since March 21, 1910, the date of the approval of the milk ordinance by the mayor.

There are ten conditions prescribed in the ordinance for the receiving and holding of permits to sell milk, the breach of any of which renders the licensee liable to forfeiture of his permit. Six of these conditions relate to the quality of the milk and four to the sanitary production thereof. Full authority is given to the city and county physician, the inspector and "any other duly authorized officers of the city and county" to take samples of milk offered for sale, with the obvious intent that such samples may be examined to ascertain whether, in the words of the ordinance, the "milk shall be deemed to be impure, adulterated, unhealthful and unwholesome." Now, as matter of fact, the first two milk inspectors serving under the city and county—Mr. Myhre and Mr. Richard—had technical training in the simpler processes of examining milk as to its purity, and this is one of the reasons why the board of agriculture and forestry desired the reappointment of Mr. Richard by the municipal authorities.

What renders the reported statements of the city and county physician the more extraordinary is the fact that he is the supreme authority over milk inspection under the ordinance. If he assumes his functions in this regard to the full extent, hope that milk inspection on the part of the city and county will cease to be a misnomer may be entertained.

While it is true that the milk ordinance is defective, although probably the best enactment that could have been made at the time of its adoption, statements that have been made to the effect that it does not contain provisions for its enforcement are scarcely justified. Under its provision for annual registration of licenses to sell milk, dairymen who do not comply with the conditions prescribed for ensuring a pure and honest milk supply may be deprived of their permits. This deprivation need not, indeed, await the period of annual registration, for the ordinance requires weekly reports from the inspector to the physician. In other words, the city and county physician has powers in the ordinance of which he does not appear to have dreamed.

Dr. Nørgaard's appreciative comments on the Hawaii County Fair and his suggestions regarding future events of the kind, either in Hawaii or other counties, are worthy of study by all homesteaders, raisers of livestock (including poultry) and dairymen throughout the islands. These classes of producers are happily becoming of such numerical strength as to give them a potent voice in dictating to the constituted authorities measures

that may be necessary to place general agricultural industry upon a proper footing in the Territory.

It will be only a few years, according to the report of the forest nurseryman in this number, when the various military posts on this island will have a parklike aspect which will make them a joy not only to the nation's defenders inhabiting them but to civilian residents of Honolulu and visitors from the outside world.

Since last month's number was issued word has been received that J. C. Bridwell, assistant territorial entomologist, left Lagos, Africa, for Durban on November 1, and intended returning home by way of Australia.

An important intimation in the report of the veterinarian for November is that the hog-raising industry, lately severely checked by hog cholera, is again coming into its own.

It is gratifying to note the progress reported by the Division of Animal Industry in the extension of bovine tuberculosis control to the islands other than Oahu.

Glenwood is one of the few places in these islands bearing a foreign name, but nevertheless its modern dairying enterprise promises to make it famous.

Fruit fly control by the natural method continues to have favorable reports of it from the entomologists in charge.

Arbor Day statistics of the latest celebration are no less gratifying than those of previous occasions.

DIVISION OF ANIMAL INDUSTRY.

Honolulu, Nov. 30, 1914.

The President and Members of the Board of Agriculture and Forestry:

Gentlemen.—I beg to report on the work of the Division of Animal Industry for the month of November, 1914, as follows:

TWENTY-THIRD ANNUAL MEETING, MEDICAL SOCIETY OF HAWAII.

On November 21st I had the honor to address, by invitation, the Medical Society of Hawaii on the subject of "Bovine Tuberculosis and Its Relation to Public Health," with special reference to that of children under five years of age. As a copy of my paper on this subject was submitted to you before it was read before the Association, you will know that its

special aim was to enlist the assistance of the medical profession of the Territory (not in Honolulu alone) in getting the milk consumer, and especially the one who provides milk for infants and children, to know and appreciate clean milk, and to demand that the milk producer, that is, the dairyman, furnish clean milk from healthy cows. Renovated or purified milk does not fill this bill, though it is better than filthy milk, but soluble impurities cannot be strained out of milk by mechanical processes, nor can milk containing the remains of one million micro-organisms in every single drop of its volume be considered clean and wholesome, just because the bacteria have been killed, or their vitiating activities retarded by either chemical or physical methods.

Immense progress has already been made towards that much desired goal—clean milk from healthy cows—especially so far as the latter part is concerned; but as regards the first part there is still very much to be accomplished. For this little Territory, however, it may be justly claimed that there is probably not a single milk producing district or community in the world that could lay claim to entrance into the same class, when the health of the dairy cows is being considered. Few if any of the devastating scourges of the dairy barns of the States or the European countries are known here. Diseases of the udder are comparatively rare, cowpox extremely so, infectious abortion is hardly known by name here, though it decimates the stables and annihilates the profits of the dairy-men in many countries; pneumonia, bronchitis and parturient apoplexy claim thousands of victims annually, in the United States as well as in Europe, to which losses may be added the cost of simply keeping the animals warm during four to eight months out of every year, and the diseases inherent upon that requirement. Then there is aphthous fever, commonly called foot and mouth disease, and which at the present time has not less than sixteen of the States tied up in rigid quarantine, with both local and interstate traffic in dairy cows and their products absolutely paralyzed. And, finally, there is bovine tuberculosis, the one disease of live stock of which we have certainly had our share and which, more than all the rest combined, has required and is requiring the full attention and best efforts of the medical and veterinary sanitarians, here as everywhere else in the civilized world, where its influence on human health and happiness and its economic import on the live stock industry have become recognized. The now unquestioned transmissibility of bovine tuberculosis to human beings, the universal spread of the disease and its insidious course render the closest co-operation between the medical and the veterinary profession imperative, if noticeable inroads are to be made toward its control and suppression; and, while much has already been accomplished here by the two professions work-

ing separately though towards the same end, it is fully expected that greater progress can be made in shorter time and at less cost now that such co-operation has been assured. Briefly, the campaign will be one of education, first, as already stated, by awakening the interest of the milk consumer in the actual source of his daily milk supply. This in itself would accomplish much, as many a milk consumer would abandon the use of milk entirely were he to visit the premises where some of the milk that is offered the Honolulu people is produced, or else he would hunt for a safer source of supply and periodically, at least, satisfy himself of its continued sanitary condition.

That the medical profession of Honolulu were not unaware of the unsatisfactory state of the local milk supply was plainly voiced by a number of both practising physicians and sanitary officials, at the meeting in question; in fact the subject proved one of absorbing interest and brought to light very strange incidents encountered by the practitioners with reference to milk furnished their patients, but which I shall not repeat here, for fear of straining the faith of the milk consuming public to the bursting point. As long as practically all infants less than one year old and at least 75 per cent of all children between one and five years must have cow's milk daily, or else either die or become stunted in their development, nothing can be gained by destroying the faith of the parents in the one substitute for mother's milk and the only nearly perfect food for children and invalids, until something better or equally good can be offered in its place. But much can be gained by destroying or reducing the criminal carelessness with which the general public accepts milk as milk, that is, as the only proper food for their children. To this end the full support of the medical profession was cheerfully granted, the support being voiced by the president and members of the Territorial Board of Health, of the Anti-Tuberculosis League and by the practising physicians through the presiding officer of the Medical Association.

By constantly bringing to the attention of the milk consumer the importance of clean milk from healthy cows the visiting physician, in families with children especially, will be instrumental in creating a corps of voluntary milk and dairy inspectors, men, women and children, who will read with interest such short notes and easily comprehend facts and figures pertaining to milk, milking methods and utensils, cows, their keep, care and characteristics, how to tell a tested from an untested cow, and which, it is expected, will appear periodically in the daily or weekly publications throughout the Territory, under an easily recognized pictorial heading, that of a good type of milk cow for instance. The progressive dairyman or milk producer will undoubtedly welcome all such visitors to his premises who come to seek information about his means

and methods of milk production, and will endeavor to keep his stables, milk room and animals as neat and clean as possible, keeping in mind the fact that his visitors may have drunk or will drink, that same day, some of the milk produced on his premises. Such visitors or volunteer inspectors should of course refrain from unkind remarks or untimely criticism. It is their privilege to change milkmen, if they so desire, and also to report any shortcomings observed by them to the proper sanitary officer for investigation. The ultimate aim of this novel form of dairy inspection is to create a crisp but friendly competition in the dairy industry which will be of benefit to the producer as well as to the consumer, as it will demonstrate in the most unmistakable manner that clean milk cannot be produced at the same price as filthy milk and that the consumer who wishes clean milk from healthy cows must expect to pay for it.

While it may seem an unnecessary remark I wish to state, in conclusion, that the above outlined plan in no way is supposed to take the place of the official milk inspection, to which the community is entitled and for which it has paid, but which has been dormant now for nearly two years. Until this important office is placed in competent hands it is obvious that much of the benefit expected from the auxiliary inspection will be lost.

FIRST ANNUAL HAWAII COUNTY FAIR.

From November 26th to 28th inclusive there was held at Hilo the first county fair ever held in the Islands. A great deal of credit is due the enterprising citizens of Hilo for this their first attempt at introducing here an oldtime, truly American institution, which admittedly has done much to speed agricultural progress over the western plains. While a territorial live stock association has been in existence for a number of years no real live stock show has ever materialized here. Handicapped by the sugar industry as the actual agricultural pursuits have always been in these islands, the so-called "small farmer" needed some fresh blood from the middle and western "West" of the United States, where the annual state or county fair still pursues its alfalfa, corn and pumpkin garnished way of victory, scattering encouragement, silver cups and many colored ribbons in its trail, to show the agriculturists of the Big Island "how to do it," and such a man was evidently found in Mr. F. A. Clowes, director of the federal experiment station's branch at Glenwood, Hawaii. Surely, nobody who had not witnessed such a County Fair, not once, but a number of times, could have rendered so close an imitation of a real middle-west county fair as did Mr. Clowes with his Hilo fair, granting due allowance for the local coloring. For surely no

middle western fair ever exhibited stalks of sugar cane weighing nearly sixty pounds apiece and measuring eighteen feet in length, or bunches of bananas that would be worth two and one-half dollars apiece if they retailed at one cent per banana; nor did any of the States in the Union ever show such a variety of fruits and vegetables, from the most tropical species as citrus, lemons and mangoes to those requiring the cold crisp air of the northern latitudes as celery, strawberries and pears, all raised within a few miles of each other, but at different altitudes—on the slopes of the sky-scraping volcanoes of the Island of Hawaii.

But as my business at the fair was in the capacity of judge of live stock it is but fitting that that branch of the show be given primary consideration here even though it were better not to do so. In extenuation of that statement it must be said that the elements had conspired to make a live stock show impossible, unless some water and weather-proof premises were available for its accommodation. The rains were simply torrential, at least to the visitors from milder climes, and while many live stock owners were there—drippingly—they could hardly be blamed for not bringing their best animals, even though they risked bringing their families. And by the same token, prizes in the form of silver cups, medals and ribbons were plentifully provided for dairy cattle, while not a single entry class even was provided for beef cattle, the second-to-sugar-cane largest industry on the island. Dairy cattle seemed to be the one item, so far as live stock was concerned, that the committee in question seemed to consider worth while encouraging, unless poultry is live stock. Although the promotion of the live stock section had been placed in the hands of my good friend and colleague, Dr. Elliot, whose ability and earnestness nobody can question, the entire idea of a competitive exhibition of live stock was so new and unlooked-for that few if any of the dairy people and live stock raisers in the district realized its meaning or had time to learn how to prepare for it. But to conclude from this that the show was a failure or that nothing was gained by it would be a grave mistake. Far from it. Every one of the exhibitors went home telling himself, "Wait till next year and I'll show you," and that is exactly what a county fair is for. Now the spirit of competition has been awakened, nothing can hold the exhibitors back, and next year's show which is planned for a more favorable climatic season, July 4th, will require premises ten times the size of the entire show just closed, in order to accommodate the live stock section only.

It is unnecessary here to go into any details in regard to the animals exhibited, beyond a word to those who carried home the silver cups; and that is to remind them that these cups have to be won three times in order to become the property of

the present winners, and that competition will be more strenuous next summer, and vastly more so in 1916. If therefore this year's winners enjoy seeing the silver cups on the side-board they will have to go to work immediately to keep it there, for those who did not carry home a cup or a medal, or even a ribbon, this time, have already made up their minds that they are going to do so next time; and it may be well for all to remember that it takes more than a week, or a month, to put an animal in blue ribbon condition, and that entry regulations will probably be far more strenuous in the future. Also that milk cows or dairy stock in general cannot be judged as to merit and value simply by their appearance, that it is their performances as milk and butter-fat producers that count, and that breeding is quite as important as conformation. Consequently future exhibits must be accompanied by either pedigrees or performance records and such anomalies as brindle Jersey bulls are not likely to be admitted, unless exhibited as freaks. That the Hilo county fair has caused a great deal more interest than would appear from the press, which for instance entirely omitted mention of the almost preponderating, if not the most important section, the poultry exhibit, cannot be doubted. Those on the Big Island who did not exhibit, and who, on account of poor means of transportation, could not exhibit, except at exorbitant cost, are possibly inclined to favor a territorial exhibition, at the expense of the county one. That is right in one way only. A territorial exposition every two or three years, to be held in Honolulu, for all of the counties to partake in would be great, but for the benefit of the great majority, who can neither afford to visit nor to exhibit at such a central affair except occasionally, the county fair as inaugurated by the recent Hilo effort is the one thing which can be appreciated and participated in by everybody. Hawaii for instance is a big island and while it might be easier, under present conditions, for certain sections—Kohala and Waimea for instance—to exhibit in Honolulu than in Hilo, still there will always remain the natural pride of the inhabitants in their own island, and therefore they should have their county fair, and transportation accommodations for themselves and their exhibits should be forthcoming, and undoubtedly will. The county fair has built miniature empires everywhere, and the ambulatory state fair has put its crown-glory on each in turn, amalgamating the state interests and spirit and putting zest and good-will into the competition for supremacy among the counties. While a county fair may be held once a year in each county and under proper management be made to pay for itself, a territorial fair held every third year for instance must be subsidized. But without such public exhibitions of individual endeavors and accomplishments much valuable time will be lost in bringing the various agri-

cultural, horticultural and animal husbandry pursuits up to the highest point. It is therefore to be hoped that the example set by the Island of Hawaii will soon be followed by the other counties and will result in a territorial organization and fair for the promotion of that spirit of endeavor and competition, the absence of which has characterized the agricultural pursuits in the Territory for the past many years.

BOVINE TUBERCULOSIS CONTROL WORK.

While the general tuberculin test has been finished, showing an aggregate of about 7000 tests for the year (as compared to 4500 for last year) with a reduction in the number of reactors of more than one per cent, it is not the intention here to discuss this subject but to call especial attention to the necessity of the extension of this most important class of work to the other islands. My visit to Hilo has fully convinced me that now is the time to begin in earnest in that section, the testing hitherto done having been more of a preliminary nature, to ascertain the probable prevalence of the disease as well as to familiarize the milk producers with the necessity of eradicating the disease, and the benefits to be derived therefrom. In this work Dr. Elliot has been ably assisted by the local Board of Health officials, a sanitary inspector having been assigned especially to the milk and dairy inspection work. This inspector accompanies Dr. Elliot whenever there is testing to be done, while the caretaker of the quarantine station is assigned the work, whenever possible, of notifying the cattle owners a day or two ahead of the arrival of the inspectors to insure that the animals are kept in for the test. For anyone familiar with the nature of the country around Glenwood, where the principal dairy section is located, it is easily understood that, when the cows have once left the dairy after being milked in the morning, it is almost impossible to bring them back again until they return at their own volition toward evening. In the same way it is extremely difficult to gather in the young stock for testing, without a regular round-up. When to this is added that the Glenwood district alone is about twenty miles from Hilo and that each test requires at least two visits, the importance of gathering in as many animals as possible becomes evident, as the escape of a single cow or the failure of keeping one or more animals in means, in many cases, an additional one hundred miles of travel, for which no charges can be made. The dairymen now seem willing enough to have their herds tested and even to have the reactors destroyed, but the difficulty of doing it with private transportation, over a district reaching from Laupahoehoe to Hilo and from Hilo to Pahala, and to make the visits fit in with the regular weekly visits to the plantation and other

stables, where Dr. Elliot's principal work is located and which cannot be neglected, has frequently proved next to impossible without sacrificing time and traveling expenses far in excess of what the inspector can afford. If therefore the work is to be at all thorough and effective it must be subsidized by this Board to the extent of at least \$50 per month additional, the present subsidy of \$50 per month being but slight compensation for the time the inspector must give to this work in that immense district. The dairy industry, both milk and butter production, is steadily increasing, especially in the Glenwood district, and few people work harder and under more unfavorable conditions than do the dairy colony in that neighborhood, but the feed is there the year around and the results show that good dairy animals can be raised there and that the immense area is good for nothing else. It would therefore seem but just that the industry be encouraged so far as possible and, it is fully believed, that can best be done by this Board by preventing the further spread of bovine tuberculosis by a subsidy as above suggested.

Another difficulty which is now being overcome was the lack of a central slaughterhouse where branded reactors could be butchered under competent inspection. This is now being remedied by the Board of Health permitting the use of an old slaughterhouse in Hilo for this purpose only, all other slaughtering being done outside the city limits and usually in out of the way places and at considerable distances where it has been impossible for Dr. Elliot to attend to the inspection without which the use of the meat from reactors should not be countenanced.

That the tuberculosis work is progressing on Maui is evidenced by a request just received from Dr. Fitzgerald for an additional 2000 ear tags, the Grove Ranch having decided to have all their cattle tested and tagged. This step is probably to ascertain if the disease has extended out among the beef cattle, and if so to stop it in its incipency after which the testing of the female stock only will be necessary.

IMPORTATION OF SHEEP FROM NEW ZEALAND.

A shipment of fifty purebred Merino rams arrived from New Zealand via Sydney and consigned to the Parker Ranch a short time ago. The animals, which are now at the quarantine station where they have been submitted to disinfecting baths as required by the federal authorities, are splendid specimens and will undoubtedly do much to improve and increase the already well-known Humuula wool clip. This shipment was further augmented by the arrival of ten purebred Shropshire rams and fifty-eight purebred Delaine Merino rams from Oregon, all likewise consigned to the Parker Ranch.

PROSPECTS OF INCREASED HOG RAISING.

The losses throughout the Territory from hog cholera which have necessitated the importation during the past year of a considerable number of butcher hogs seem now to have abated sufficiently to allow of a revival of the hog industry on a hitherto unknown scale. An importation of several hundred purebred brood sows of various breeds, but principally Berkshires, Poland Chinas and Duroc Jerseys will arrive here shortly. It is the intention of the enterprising importer to utilize the rich mess offal (swill) which daily accumulates at the military barracks on this island, and especially at Schofield, in immense quantities, as the principal feed, and a splendid location has been selected for the erection of an up-to-date sanitary piggery which is now under construction. Every precaution known to science will be taken to guard these valuable animals against hog cholera or any other infection as well as for the speedy application of the serum treatment in case the disease should find its way to them.

If successful the enterprise will undoubtedly prove a very remunerative one, especially while the hog prices remain where they now are, and it seems safe to predict that next year will see few if any butcher hogs imported from the mainland.

BIENNIAL REPORT.

The report of this division for the years 1913-1914 is now under preparation and will require all the time which can be spared from the routine work of the division.

A separate letter containing the estimates for improvements at the quarantine station is herewith appended.

Very respectfully,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, November 30, 1914.

Dr. Victor A. Norgaard, Chief of Division of Animal Industry.

Sir:—I have the honor to submit the following report for the month of November, 1914:

Tuberculosis Control.

The following dairy cattle were tested during the past month:

	T.	P.	C.
O. R. & L. Ranch at Kahuku.....	357	357	0
do do	234	233	1
do Malaekahaua....	309	302	7
Waialae Ranch (tested by Norgaard)	69	58	11
T. H. Cummings.....	1	1	0
John do Moral.....	7	7	0
Shimada	8	8	0

The above tabulated list gives a total of 985 head tested out of which 966 head were passed and tagged and 19 head condemned and branded.

The following post mortem examinations were made.

No. 1. A two-year-old heifer condemned Oct. 30 at the Pond Ranch, Mokuleia. Lesions: Small nodules in the retro-pharyngeal glands. There were no other evidences of disease.

No. 2. Grade cow condemned November 13th by Dr. Norgaard at Waialae Ranch. Lesions: Two mediastinal glands diseased, one of which was greatly enlarged and filled with caseous tuberculous material; one small nodule in the diaphragmatic lobe of the right lung. No other lesions.

No. 3. Jersey bull two and a half years old brought from the Coast by A. L. MacPherson June 17, 1914. The animal was in very poor physical condition, being extremely emaciated; there was no appetite; the breathing was accelerated and labored; there was an occasional cough. Auscultation of the chest cavity revealed tinkling metallic sounds indicative of traumatic pericarditis. The animal was first subjected to the intradermal tuberculin test to which it gave no reaction. After consultation with the owner it was decided to kill the bull and make post mortem examination. This examination revealed the following condition: Purulent pericarditis; lungs showed several pneumonic areas, both diaphragmatic lobes were firmly attached to the diaphragm and the azygous lobe was firmly attached to the pericardium. The pericardium was enormously distended and thickened to a quarter of an inch and contained about a liter and a half of foul-smelling pus. Several pieces of wire were taken from the reticulum which was itself firmly attached to the diaphragm. The entire carcass was condemned as unfit for human consumption because of the extreme emaciation and peculiar odor of the flesh.

Importations of Live Stock.

Sonoma, San Francisco: 1 crate turkeys, Wm. Knight.

Manoa, San Francisco: 2 dogs, W. F. X. Company; 16 crates poultry.

Chiyo Maru, Orient: 1 crate Japanese games; 2 Japanese Spaniels, P. Ryan.

Matsonia, San Francisco: 18 crates poultry, 2 crates Belgian hares.

Hilonian, Seattle: 2 Holstein heifers, 7 Duroc Jersey hogs, 2 Duroc pigs, H. C. & S. Co., Maui; 1 crate poultry, W. F. X. Company.

Kentuckian, Seattle: 8 horses, 5 mules, 7 cows, 2 calves, 318 butcher hogs, 12 hogs for breeding (Hampshires), A. L. MacPherson.

Sierra, San Francisco: 1 crate white Leghorns, J. Forgety.

Lurline, San Francisco: 16 crates poultry, 2 Jersey heifers, J. P. Mendonca.

Wilhelmina, San Francisco: 36 crates poultry.

Ventura, San Francisco: 1 dog, Mrs. McShane.

Respectfully submitted,

L. N. CASE,
Assistant Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

Honolulu, November 30, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the work performed by the Division of Entomology for the month of November, 1914, as follows:

During the month 39 vessels arrived at the port of Honolulu of which 22 vessels carried vegetable matter.

Disposal.	Lots.	Parcels.
Passed as free from pests.....	1208	30,740
Fumigated	9	123
Burned	39	39
Returned	4	4
Total inspected.....	1260	30,906

Of these shipments 30,656 packages arrived as freight, 153 packages through the postoffice and 97 packages as baggage of passengers and immigrants.

Rice and Bean Shipments.

During the month 29,557 bags of rice arrived from Japan, and 82 mats of rice from China, also 5441 bags of beans from Japan which, after careful inspection, were found free from pests and were passed for delivery.

Pests Intercepted.

Thirty-eight packages of fruit and one package of vegetables were found in the baggage of passengers and immigrants from foreign countries. These were seized and destroyed by burning. One package of chestnuts from Kentucky, U. S. A., was found infested with the chestnut weevil (*Balaninus* species); another package of forest seeds from Ceylon was found infested with weevils (*Bruchus* species); both were fumigated with carbon bisulphide before delivery. Two large boxes of ornamental plants arrived from Japan and were fumigated and all soil removed from the roots of the plants. In this soil were found the larvae and pupae of a small weevil said to be quite injurious to pot plants in Japan; some larvae of the *Anomala* were found, also one larva of *Sericea japonica*. All these species are injurious to the roots of various plants.

On November 17th Mr. Muir arrived from Japan with three cages containing parasites of the *Anomala* beetle and Japanese Rose beetle. These were taken to the H. S. P. A. Experiment Station and carefully inspected, and are now in the care of the entomologist of that station.

The Territorial Market asked permission to use our fumigating room on Pier 10 for fumigating various seed shipments before storage and I granted their request. We also fumigated a lot of infested beans and corn for one of the local firms.

Beneficial Insects.

Mr. D. T. Fullaway has been quite successful in breeding the recently introduced parasites and has been able to liberate a number of colonies. During the month 15,775 parasites were liberated which comprised the following species:

For Fruit Fly—African parasite (*Opius humilis*), 1250; Proctotrupid (*Calesus silvestrii*), 700; African Tetrastichus (*Tetrastichus giffardi*), 1050; total, 3000.

For Hornfly, Stable Fly and House Fly—Philippine Spalangia, 5500; Hornfly (*Huscidifurax vorax*), 2600; Philippine Pteromalid, 4000; Chalcid (*Dirhinus giffardii*), 675; total, 12,775.

As the Chalcid has been reared from dung fly pupae in the insectary it was decided to liberate a few of these in a good locality where abundant fly pupae existed and to see later on if we can recover this parasite from such material in the open. Attached hereto is a brief report from Mr. Fullaway.

Brother M. Newell of Hilo reports the arrival of seven steamers, five of which brought vegetable matter consisting of 215 lots and 3191 packages which were passed as free from pests. He also reports the arrival of the Seyo Maru direct from Japan with a cargo of rice, 1950 bags; beans, 188 bags,

and peanuts, 50 bags, which he found free from pests and passed the shipments.

Inter-Island Inspection.

During the month of November 60 steamers plying between the Islands were attended to and the following shipments were inspected and passed:

Plants	77 packages.
Taro	502 bags.
Vegetables	15 packages.
<hr/>	
Total passed	594 “

The following packages were refused shipment on account of infestation or of having undesirable soil attached to the plants:

Plants	21 packages.
Fruits	17 “
<hr/>	
Total refused	38 “

Respectfully submitted,

E. M. EHRHORN,
Superintendent of Entomology.

Honolulu, November 30, 1914.

E. M. Ehrhorn, Superintendent of Entomology.

Dear Sir:—Permit me to report the following operations in the insectary during the past month:

In addition to carrying along the Silvestri parasites and other material we have produced:

- 2450 individual of *Tetrastichus giffardii*,
- 93 females and several hundred odd males of *Diachasma fullawayi*.
- 2 males of the black *Opius*, species undetermined.
- 1 female and 2 males of a third species of *Opius*, undetermined.

The number of pupae handled to produce *Tetrastichus* was 1967 and allowing fifteen parasites to the pupa—a fair average I think—this would give a parasitism of $8\frac{1}{4}$ per cent. The number of pupae used to produce the *Opius* was 10,559 and the parasitism is about $3\frac{1}{3}$ per cent. We were able to liberate also altogether 1050 *Tetrastichus* as follows:

Nuuanu Valley, McLean's place, 300 under kamani trees;
 Gartley's place, 300 under scrub guava.
 Manoa Valley, Cooper's place, 450 among fallen oranges.

Very truly yours,

D. T. FULLAWAY.

DIVISION OF FORESTRY.

Honolulu, November 30, 1914.

Albert Waterhouse, Esquire,
 Acting President and Executive Officer,
 Board of Agriculture and Forestry.

Dear Sir:—I herewith submit a report of the principal work done during the month of November, 1914:

Nursery.

Distribution of Plants.

	In Seed boxes.	In boxes trans- planted.	Pot grown.	Total.
Sold . . . . .	....	....	50	50
Gratis . . . . .	....	....	911	911
Sent to Koolau Forest Reserve, Maui . . . . .	....	2200	....	2200
Sent to Waihou Spring For. Reserve, Maui. 1250	1250	1250	....	2500
Total	1250	3450	961	5661

Collections.

Collections on account of plants sold amounted to	\$.75
Rent of building, nursery grounds	35.00
Total	\$35.75

Plantation Companies and other Corporations.

The distribution of plants under this heading amounted to 38,000 seedlings of Eucalyptus and Ironwood.

Makiki Station.

The work at this station, also at the nursery on King street, has been principally in connection with Arbor Day. The packing and sending out of trees for Arbor Day planting required all of the men at both places for about two weeks. A special Arbor Day report on the distribution of trees, etc., has been submitted. As our stock is now considerably reduced we will require to spend most of our time in propagating and transplanting for the next two or three months.

Honolulu Watershed Planting.

During the month 837 koa and 576 kukui trees were planted. The trees previously planted are doing very well. The weather has been favorable for tree planting for the past two months, consequently we have been able to plant the trees just as soon as the holes were ready for them.

Tree Planting on Forest Reserves.

We have sent to Mr. W. A. Anderson at Nahiku, 2200 Eucalyptus robusta trees in transplant boxes to be planted along the makai boundary line of the Koolau forest reserve at Nahiku, Maui. To Mr. von Tempsky we have forwarded 1250 Grevillea robusta trees in seed boxes and 1250 Cryptomeria Japonica in transplant boxes to be planted on the Waihou Spring forest reserve near Olinda, Maui.

Mr. George R. Carter, who controls a piece of government land at the top of Manoa Valley, has planted 500 trees of various kinds.

At Moloaa forest reserve, Anahola, Kauai, Mr. Kaina D. Lovell, who has charge of the planting, reports that the plum seeds are sprouting nicely and already from 2000 to 3000 are showing above ground.

Seed Exchanges.

We have received from the director of the Botanic Gardens, Paradeniya, Ceylon, a package of seed containing 13 packets of seed, some of which we have not tried before.

From Mr. William Harris, superintendent of public gardens, Kingston, Jamaica, we received two packages of seed of Juniperus australis, the juniper cedar of Jamaica. This juniper is closely allied to the species of which Mr. Gerritt Wilder sent us seed and which promises to be one of the most valuable introductions we have had for many years. The trees are doing exceedingly well on different parts of the islands where they have been planted. Mr. Harris, in his letter, describes the

juniperus cedar as follows, in part: "I now have pleasure in sending you two bags of seed of Juniperus cedar of Jamaica. It yields a beautiful timber which is used for furniture, cabinet work, interior ornamental house work, etc. It grows in the mountains from 3000 to 6000 feet altitude." The seed sent is germinating nicely and we will have a large number of trees providing nothing unforeseen happens."

Advice and Assistance.

The writer has, at the request of various people, paid the following number of visits and answered questions by letter and telephone: Visits to places in and around the city, 10; persons asking for advice by telephone, 9; persons asking for advice at nursery, 16; persons asking for advice by letter, 4.

Very respectfully,

DAVID HAUGHS,
Acting Supt. of Forestry and Forest Nurseryman.

ARBOR DAY.

Honolulu, November 30, 1914.

Albert Waterhouse, Esq.,
Acting President and Executive Officer,
Board of Agriculture and Forestry.

Dear Sir:—I herewith submit a special report on the distribution of plants for Arbor Day, November 20, 1914:

Arbor Day.

The following tables will show that the demand for trees is increasing and that the past Arbor Day, which took place on November 20, will prove to be one of the most successful of any yet held. More people in and around the city are taking an interest in beautifying their homes. Homesteaders who have recently taken up homesteads are particularly interested in trees for wind breaks, boundary lines and for shade and ornaments around their homes.

The new military posts, which when first occupied by the different companies were practically destitute of trees, are now receiving the attention of the officers and men and large numbers of trees are being planted. The officers connected with the different organizations at Schofield Barracks ordered over 4000 pot grown trees for Arbor Day planting. It is gratifying to know that a great deal of interest is now being

taken by the military people at the different posts. Their eager inquiries regarding the planting and care of trees is a guarantee that the trees will get the best of attention.

The applications for trees from people living in and around Honolulu has increased over 100 and the total distribution of pot-grown plants over 3000 since last Arbor Day.

The demand for trees for school grounds has been less this year than for former years. This may be accounted for by the fact that for a number of years we have been sending trees to the schools and the grounds of most of them are now sufficiently stocked and do not require more.

The voluntary aid given by the various newspapers in Honolulu and on the other islands in publishing articles in regard to Arbor Day has greatly helped us in making the day a success. We wish to take this opportunity to convey our thanks to all of the newspapers which kindly published articles and in other ways assisted us in notifying the general public of our object.

Distribution by Islands.

Oahu—	Applications.	Trees.
Oahu outside of Honolulu.....	21	526
“ Schofield Barracks .....	..	4,062
“ Honolulu and neighborhood..	346	8,305
	<hr/>	<hr/>
	367	12,893
School Children on Arbor Day (1 tree each).....	650	650
	<hr/>	<hr/>
Total for Oahu.....	1,017	13,543
Hawaii	24	925
Kauai	17	1,870
Maui	51	1,334
Molokai	2	106
	<hr/>	<hr/>
	94	4,235
Schools—		
Outside of Honolulu (Oahu).....	4	63
Honolulu	7	109
Hawaii	2	63
Kauai	4	171
Maui	4	311
	<hr/>	<hr/>
	21	717

Summary of Plants Distributed.

	Plants.
Island of Oahu, including Honolulu.....	13,543
“ “ Hawaii	925
“ “ Kauai	1,070
“ “ Maui	1,334
“ “ Molokai	106
Schools on all Islands.....	717
Grand total	17,675

In addition to the above about 5000 seedlings in seed boxes were sent to homesteaders on Kauai.

Respectfully,

DAVID HAUGHS,
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

Honolulu, December 9, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the Division of Hydrography during month of November, 1914, is submitted:

Rainfall.

During the first half of the month rainfall throughout the islands was generally light, but during the latter part of the month several heavy storms occurred, though not of sufficient intensity to cause much damage.

Ditch Seepage Investigations.

Following our proposal to the Hawaiian Sugar Planters' Association to extend experiments in ditch seepage losses, seven more plantations have expressed a desire to coöperate with the Division of Hydrography in this work. The following plantation companies have expressed a desire to have seepage loss investigations conducted on their irrigation ditches:

Honolulu Plantation Company, Oahu.
Ewa Plantation Company, Oahu.
Maui Agricultural Company, Maui.

Kekaha Sugar Company, Kauai.

Pioneer Mill Company, Maui.

Oahu Sugar Company, Oahu.

Waialua Agricultural Company, Oahu.

Seepage investigations on these plantations will be started shortly after January 1, 1915.

Several experiments in seepage losses completed in November at the Waipio experimental farm show an average loss of 7 per cent in the main ditches, and about 9 per cent in the level ditches.

Oahu.

Mr. Kimble visited the coöperative stations on the Kahuku and Laie plantations, and completed the field work and report on seepage losses at Waipio experimental farm.

Mr. Austin visited 30 gaging stations during the month and made 22 regular and one miscellaneous measurements.

The acting superintendent of Hydrography visited 13 gaging stations on Oahu. The latter part of the month was spent on a visit to Maui to inspect the clock register stations.

Kauai.

The last of the construction work to be undertaken at present on Kauai was finished during the month, with the completion of the Stevens clock register station on East Wailua Stream. The gage house on the North Wailua Stream station was moved back to a higher elevation and just in time to escape damage by a heavy flood which occurred a few days after its removal.

Mr. Dort visited 11 gaging stations and made 12 regular and one miscellaneous discharge measurements. Mr. Horner visited 10 gaging stations and made three discharge measurements at regular stations. He also visited 10 rainfall stations.

Maui.

As Mr. Bailey spent the greater part of the month in Honolulu as acting superintendent of Hydrography, the only work done on Maui was to make an inspection trip to the clock register stations. During the period November 24 to 30th Mr. Bailey visited one rainfall station and 19 stream gaging stations,—making two discharge measurements.

Kona, Hawaii, Report.

Mr. Kimble spent four days assembling and preparing data maps, and estimates on the Kona report. This will be completed by December 31, 1914.

Plans for December, 1914.

Oahu.

Mr. Kimble will complete the Kona report which will take about two weeks. He will also visit the coöperative stations on Kahuku and Laie plantations.

Office work on data for 1914 report will be brought as nearly up to date as possible.

Kauai.

The work on Kauai during December will be chiefly maintenance. An attempt will be made to procure desirable measurements to further develop the rating curves,—especially at the new stations.

Maui.

The only work to be done on Maui will be a trip to inspect automatic gages and procure fourth-quarter records.

Hawaii.

The Acting Superintendent of Hydrography will visit Hawaii about the middle of the month to secure discharge data desired by the territorial Attorney-General.

General.

Mr. Larrison, who is attending a conference of the district engineers of the U. S. Geological Survey held in Washington, D. C., in December, is expected to return to Honolulu about the middle of January, 1915.

Very respectfully,

C. T. BAILEY,
Acting Superintendent of Hydrography.

During the past two years forest officers have killed nearly 9000 predatory animals, more than three-fourths of which were coyotes.

The arboretum established at Washington in Rock Creek Park, through co-operation between the forest service and the District of Columbia, now contains 1200 trees, comprising 92 different species.

A BIOLOGICAL SURVEY OF OAHU.

By Vaughan MacCaughey.

Professor of Botany, College of Hawaii.

The first step in the development of any comprehensive project is a survey of the field. This is true in engineering, in social relief, in science. The preliminary survey, the reconnaissance, the sweeping view of the large topography, these are the initial and necessary steps. The ultimate completeness of the survey may depend upon any one of a considerable number of governing factors. Limited facilities may compel a survey to be meager and inadequate; obscure and highly complicated problems may prolong it over a long period of time. Whatever may be the status of its scope or thoroughness, the survey work normally precedes and underlies the other investigational work of its field.

In the realm of natural history we find a striking variety of surveys. The remarkable explorations of Humboldt, Darwin, Lewis and Clark; the expeditions of the Challenger and of the Albatross; the surveys undertaken by governmental bureaus—meteorological, soils, botanic, topographic, ornithologic, silvic; the minute local records of such naturalists as White, Thoreau, and Burroughs—these are fairly representative of the various widely differing types of natural history surveys.

THE FEDERAL SURVEY.

The term "biological survey" has several applications. One of the bureaus of the federal department of agriculture is designated as the Biological Survey. Due to the historical peculiarities of governmental organization this bureau's "biological" work is in reality limited largely to problems relating to native birds and mammals of economic importance. Its work, for example, does not usually include fishes, (these being the concern of the United States Fish Commission),

During the past three years survey work by the federal bureau has been maintained in Alabama, California, Idaho, Louisiana, Wyoming, North Dakota, Mississippi, and New Mexico. The bureau reports that "requests for coöperation in biological survey of Iowa and Nebraska have been received and work in those states will be inaugurated as soon as appropriations are available. . . . For several years requests have been received for coöperation with the State University and State Agricultural College of North Dakota in a biological survey of the State. . . . By the plan of coöperation arranged the Biological Survey and the State are to share equally in the expenses of field work and in preparing final reports."

The sense in which the term "biological survey" is used in this paper is as follows. A biological survey of a given region is an enumeration of all of the organisms, (both plants and animals, fossil and living), that inhabit the region, together with an adequate explanation for the specific distribution, both in time and space, of each organism. This definition includes then two types or classes of data, first, the list of plants and animals; second, statements elucidating the distribution of each form. As stated by Dr. C. Hart Merriam, for many years Chief of the U. S. Biological Survey,—“The primary object of mapping the geographic distribution of species is to ascertain the number, positions and boundaries of the natural faunal and floral areas—areas which are fitted by nature for the existence of certain native animals and plants. . . . The obvious reason why certain animals and plants inhabit restricted parts of the earth's surface and do not occur in other parts, where there are no impassable barriers to prevent, is that such species have become adapted to the particular physical and climatic conditions there prevailing, and their sensitive organizations are not sufficiently plastic to enable them to live under other conditions.

“The present biological survey . . . has demonstrated that mammals, birds, reptiles, insects and plants so coincide in distribution that a map showing the boundaries of an area inhabited by an association of species in one group serves equally well for other groups. The reason for this coincidence in distribution is that all terrestrial forms of life inhabiting the same area are exposed to the same surroundings and governed by the same general laws.”

It is at once evident that whereas the first function of this survey is purely biological, the second is dependent upon surveys conducted by the other sciences. Statements as to the distribution of each organism have little significance until preceded by the following surveys:

1. Topography or physiographic.
2. Hydrographic.
3. Geologic.
4. Meteorologic or climatic.
5. Soils.

With this data available, the proper correlations can be made between the distribution of organisms and the physical factors of their environment.

SURVEYS IN HAWAII.

The Hawaiian Islands, although known to scientists for over a century, and notable among island groups for their remarkable natural history phenomena, have never been favored with a biological survey. Scientific work of greatest value

has been consummated in various isolated aspects of Hawaiian natural history, and embodied in appropriate and substantial publications. The following list includes the larger and more important of these studies.

Ocean, Marine Life and Fishes—U. S. Fish Commission Reports.

Geology, Volcanoes—Brigham, Hitchcock, Dutton, Perret, Dana, Volcano Research Association, etc.

Topography—Maps of U. S. Topographic Survey; Coast and Geodetic Survey.

Weather and Climate—Reports of U. S. Weather Bureau.

Soils—Reports of U. S. Experiment Station, H. S. P. A. Experiment Station.

Hydrography—Reports of U. S. Hydrographic Survey.

Plants—Hillebrand, Gray, Mann, Brigham, Wawra, Forbes, Rock, Board of Agriculture and Forestry, U. S. Forest Service.

Animals—Fauna Hawaiiensis.

Birds—Birds of the Sandwich Islands; Bryan.

Insects—Fauna Hawaiiensis, papers of Hawaiian Entomological Society.

Molluscs—Gulick, Pillsbury, Cooke.

The total literature describing Hawaiian natural history is thus evidently both extensive and diversified. Practically every aspect of nature has been monographed in some form or other. The great unaccomplished task is the proper co-ordination of this diffused mass of data, in a form that will make possible the accurate plotting of biologic zones.

STATEMENT IN FAUNA HAWAIIENSIS.

Perhaps the most sumptuous and scholarly account of Hawaiian natural history is the splendid British "Fauna Hawaiiensis," "being results of the explorations instituted by the Joint Committee appointed by the Royal Society of London for Promoting Natural Knowledge and the British Association for the Advancement of Science and carried on with the assistance of those bodies and of the trustees of the Bernice Pauahi Bishop Museum at Honolulu." The committee was appointed in 1890, the last volume of this monumental work is dated January 15, 1913. The following excerpts from the preface of Dr. Sharp are significant in connection with the proposed biological survey:

"The committee decided to undertake an exploration of the Islands, and was so fortunate as to secure for the purpose the services of Mr. R. C. L. Perkins, then a young graduate of the University Oxford. Dr. Perkins continued his exploration for some years. As he has given an account thereof in the Introduction that follows this prefatory notice, it is unnecessary to give particulars here, beyond saying that he underwent great

dangers and fatigues, in his arduous and solitary task, with the most determined perseverance, the most unflinching courage; camping out in the mountains, without a companion, for periods as long as he was able to carry food and equipment.

As the result of his work the Committee found itself in possession of an enormous number of specimens, and in pursuance of its work decided on investigating this material and reporting thereon.

It is not possible to state exactly the number of specimens that have resulted from Dr. Perkins' labors, but it cannot be far short of 100,000, and not improbably exceeds that number. The Insects of the Archipelago were previous to this investigation supposed to be scanty in the number of species, and it was believed that individuals of each species were as a rule also very few. Both these conclusions have now been shown to be incorrect. Dr. Perkins estimates the number of known species of this class of animals to be upwards of 3300; and he considers this number to be probably not much more than one-half of the total Hawaiian Insect-fauna.

The other Classes of Arthropoda are represented by a considerable number of species. Mollusca is specially rich, nearly 500 species or forms having been recorded. Aves has about 50 peculiar species. The other classes of animals have been by no means satisfactorily investigated, so that no general zoological census of the islands can yet be given. But it may be said that at the present time if an exhaustive list of the land and marine fauna could be compiled it might amount to 10,000 species, the great majority of them being peculiar to these precincts. And even this number is liable to be greatly increased if the classes of microscopic animals were included: the Protozoa being, so far as is known to the writer, still untouched. These points are mentioned because it would be a matter for profound regret were it supposed that the work of this committee—long as it may have lasted—has completed our knowledge of Hawaiian zoology. The islands having now passed into the control of a State super-abundant in wealth and power we may hope that some real effort may be made, by means of local associations or expeditions from the United States, to supplement our imperfect knowledge."

BEGIN WITH OAHU.

A detailed biological survey is a time-consuming and expensive undertaking. Parties must be maintained in the field for considerable periods, or numerous short expeditions must be carefully planned and made. In either case a suitable base is of great importance. For these and other reasons it seems desirable that the Island of Oahu be chosen as the field for the first biological survey. The following reasons may be stated:

1. Oahu includes a striking variety of ecologic areas. For example within a radius of half a dozen miles of the College of Hawaii campus occur the following well-defined ecological districts:

1. Manoa Valley—one of the largest of the Oahu valleys, with a large amphitheater of erosion; broad, flat floor; and precipitous, ridged walls.

2. Waikiki Flats—extensive coastal plain, artificially flooded, and planted with various wet-land crops.

3. Kaimuki Region—secondary volcanic craters, with lava flows and volcanic debris.

4. Extinct craters of Diamond Head, Punchbowl, Roundtop, Sugar-loaf, Tantalus and Kaaui.

5. Coral Reefs—lagoons and fringing reefs, along the entire southern coast of Oahu; rich in marine life.

6. Waialae—an arid portion of the coastal plain, with tongues into the valleys adjacent.

7. Koolau Range—average elevation 2200 feet, with dense indigenous rain-forest.

8. Introduced plantings—eucalyptus, prosopis, etc., in extensive groves and woodlands.

9. Strand regions—comprising coral, lava and tufa beaches.

10. Valleys and streams—Moanalua, Kalihi, Nuuanu, Pauoa, Makiki, Manoa, Palolo, Waialae, etc.

11. Foothills and ridges—eroded remnants of the original Koolau volcanic dome.

12. Caverns and “lava tubes”—formed chiefly through former volcanic action.

13. Deep Sea—at a relatively short distance from the shore line.

This list is not complete nor detailed, but it will serve to indicate the unique variety of life-conditions.

2. The various parts of the island are easily accessible. To quote a previous article:

“From the standpoint of collegiate studies, all of these regions are quite accessible; many of them are within half-day’s walk, and the most remote can be reached within a day. In addition to the system of public roads, plantation roadways, wagon trails, and foot trails, there are two railway lines, a number of stage lines, and motor car services. There are also available a number of excellent maps, including trail maps. Food supplies and drinking water are obtainable throughout the island. It is therefore a relatively simple matter to make an expedition to any given region, to transport needful scientific apparatus and equipment, and to continue the studies and collecting for as long a period as is desirable.

There is perhaps no other region in the world, similarly blessed with all of the conveniences of modern civilized socie-

ty, where so many widely differing types of tropical environment are so easily available within small compass."

3. Honolulu, with its numerous scientific bureaus and educational institutions, can serve most favorably as a base.

4. These same bureaus, schools, and other organizations can make good use of the results of such a survey. A biological survey of Oahu would be utilized by a large number of individuals and institutions, both private and governmental. Two quotations from publications of the College of Hawaii will illustrate this point:

"Not only is this remarkably varied region quite available for college work and investigation, but it is also accessible every day in the year, due to the charming climatic conditions of Hawaii. The absence of a winter season, the entire absence of snow and frost, the great rarity of storms, and the balmy quality of the showers, make it possible to conduct field studies on any day of the college year. There is no dormant or leafless season; plant life flourishes throughout the year, and field observations and collecting suffer no abrupt changes because of seasonal inclemencies.

"The natural background of the college thus afford an unrivalled out-door laboratory. It is the policy and practice of the botanical instruction of the college to utilize, so far as is practicable, this natural background. Field work holds an important place in both elementary and advanced instruction. The abundance of fresh material, easily obtainable, adds to the effectiveness of all of the biological instruction."

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PHYSICAL FEATURES OF OAHU.

An excellent concise statement of the general physical features of Oahu appears in Martin and Pierce's "Water Resources of Hawaii (U. S. Geological Survey, Watersupply Paper No. 318). This account will serve to describe in a fairly complete manner the area for which a biological survey is proposed.

"The Island of Oahu lies midway between Kauai on the northwest and Maui on the southeast. It is separated from Kauai by Kaieie Waho channel (width 63 miles), and from Molokai, which lies between Oahu and Maui, by Kaiwi chan-

nel (width 23 miles). It is 2100 miles southwest of San Francisco in latitude $21^{\circ} 30'$ north and longitude 158° west. It is somewhat north of the geographic center of the main group, and is third in size, but it is pre-eminently the most important member of the group.

"In shape Oahu is somewhat trapezoidal. The bases of the trapezoid are at the northeast and the southwest, and the legs are at the south and northwest, the latter being at right angles to the base. The longer base is about 37 miles long; the shorter, about 22 miles. The legs at the south and northwest are about 29 and 22 miles in length respectively. The shortest distance across the tableland from Kaiaka Bay at the north of Pearl Lochs at the south, which extends 5 miles inland, is about $15\frac{1}{2}$ miles. The total area of Oahu is 598 square miles, as compared with 4015 square miles for Hawaii and 728 for Maui.

MOUNTAIN RANGES.

"Oahu Island has two distinct mountain ranges, a feature which makes it unique as compared with the other islands, none of which has any distinct mountain range. The Koolau range at the northeast extends the full length of the island, the crest being approximately parallel to the shore and only 3 or 4 miles inland. The Waianae range extends almost the entire length of the southwest side, the crest being from 1 to 5 miles from the shore. These ranges are separated by a tableland which rises to an elevation of 800 feet in the saddle near the center of the island, from which point it slopes gently downward to the north and to the south. Both these ranges are at right angles to the northeast trade winds which blow for about nine months of the year, and both are exposed more or less to the severe southwestern storms, or konas, which prevail at times. Each shields the other to a greater or less extent, and this helps to explain some of the present physical features.

"The Waianae mountains are very much older than the Koolau mountains. They are probably as old as Kauai, and originally formed a single island much larger and higher than the present Waianae mountains. Erosion had probably eaten deeply into the northeastern and southwestern slopes and completely obliterated all trace of the original crater long before the Koolau mountains on the east had emerged from the ocean. The successive lava flows from younger Koolau then piled up along the eastern base of Waianae, filling the valleys and covering the ridges, thus obliterating the effects of earlier channeling on that side. On the southwest side, however, nothing of the kind has occurred. The original valleys have been broadened, deepened, and extended farther into the heart of

the mountains where they terminate in almost vertical corrugated walls. Lualualei, Waianae and Makaha are the most prominent of these valleys. Kaala peak, back of Waianae valley, elevation 4040 feet, is the highest point on Oahu.

"The Koolau mountains came into being long after the Waianae mountains. They were built up by successive lava flows which, on the west, overlapped the eastern slopes of Waianae and filled up its valleys. As soon as the Koolau range had reached a sufficient height it formed a wind barrier in the path of the trades, which largely robbed the clouds of their moisture before they reached the Waianae mountains, so that thereafter the rainfall in these mountains became much less, with the result that the denuding agencies also became less active. The Koolau Range not only protects the Waianae mountains on the west but is in turn shielded by them from the severe kona storms that come from the southwest. The extent of this protection is well shown by the great difference in erosion on the western and southern slopes of the Koolau mountains. On the south the slopes are unprotected, with the result that deep, broad valleys, such as Palolo, Manoa, Nuuanu and Kalihi, all back of Honolulu, have eaten their way into the very core of the range. Indeed, Nuuanu and Kalihi have cut through the core forming the low pass at the head of each valley.

"The eastern side of Koolau range is very much unlike the western side. It is divided into two parts by the Kualoa ridge, or spur, which juts out from the middle of the main range as a sort of headland north of Waikane. North of Kualoa are several deep valleys which extend well back into the range and are separated from each other by spur ridges that branch off from the main range. The valleys and ridges have probably resulted entirely from erosion. South of Kualoa the spur ridges separating the different valleys are almost entirely wanting. The result is that the heads of the various short alcove valleys form an almost continuous corrugated wall or precipice, 3 or 4 miles from shore, 1000 to 1200 feet high and 10 or 12 miles long. The area between the sea and the base of the cliffs is comparatively open rolling country across which short streams course to the sea. The existing cliff forms may be due entirely to erosion, as maintained by some authorities, wholly subaerial or partly submarine, or they may have originated in a long fissure, as suggested by Dana, which resulted in a mass east of the rupture sliding into the sea. As bearing on Dana's theory, it is interesting to note that practically all the streams south of Kualoa seem to originate in constant high level springs which are about 1000 feet above the sea back of Waikane and Waiahole and decrease in elevation toward the south. These springs appear to emerge from porous strata

overlying an impervious stratum which dips gently to the south and probably to the west away from the face of the cliff.

DIVERSIFIED SHORE AND CORAL REEFS.

"The shore line of Oahu is much more irregular than the shore line of any of the other islands. There are important points on all sides of the island, the most prominent of which are Diamond and Koko Heads, Makapuu, Mokapu, Kahuku, Kaena and Barbers points. There are also good bays, the most important of which are at Honolulu and Pearl harbors on the south side. Pearl Lochs, 6 or 7 miles west of Honolulu, is the site of the naval station and is said to form one of the safest and best harbors on the Pacific.

"Oahu has more coral on and around it than any of the other islands. Extensive living coral reefs almost completely girdle the island, closing the entrance to the bays except where enough fresh water is received from streams or springs to maintain an opening to the sea. The coastal plain which extends almost entirely around the island consists mainly of uplifted coral, especially on the south side; and coralline limestone strata are encountered in well borings at various depths below sea level.

"The distribution of coral below and above sea level is one of the principal evidences of long periods of subsidence followed by later upheaval. Well borings show alternations of basalt clay, earth, limestone, and hard basaltic sheets to a depth of several hundred feet. Hard coral has been encountered at 800 feet below sea level, and broken coral at somewhat greater depth. These facts lead to the conclusion that the island has been depressed 700 or 800 feet. Surface coral near the shore indicated a later upheaval of 50 feet or more. At Waipio, just west of Pearl Lochs, there is a stratum of oyster shells 3 or 4 feet thick and probably 20 feet or more above sea level.

HYDROGRAPHY.

"The conditions just described have given to Oahu the distinction of having the best artesian water supply of any of the islands. The principal water-bearing stratum is a vesiculated basalt which lies 300 to 400 feet below sea level and which is overlain by an impervious cover. The water in flowing wells originally reached 42 feet above sea level at Honolulu, 32 feet at Ewa, and 26 feet at Kahuku. The height is now considerably less than it was originally. In addition to the large number of flowing wells, there are many others which are pumped. In all nearly 500 wells have been sunk on Oahu, chiefly on the south side.

"The rainfall on Oahu is comparatively less than on the

other large islands. It ranges from 31 inches a year in the business center of Honolulu to 21 inches at Ewa and Waianae, all on the south side. On the mauka side of Honolulu City the rainfall ranges from 40 or 50 inches to 90 inches just back of the city. The rainfall reaches 140 or 150 inches in Nuuanu and Manoa valleys, but is considerably less on the mountains. On the windward side of the island the rainfall is less than 100 inches. It probably does not exceed 100 inches on an average anywhere on the Koolau range. On the Waianae range the rainfall is light.

"The forest cover is restricted largely to the higher slopes which are now in forest reserves and are being reforested. The lower slopes have been largely denuded by cattle.

"On account of the nature and arrangement of Oahu's mountain ranges there are fewer running streams than on the other large islands. The streams that exist are also smaller, as a rule. Except near Honolulu, most of the streams on the west side of the Koolau mountains are intermittent in flow. For a short time after storms they carry water which is taken into ditches constructed for storm water, but they are practically dry for the greater part of the time. Kaukonahua stream, at Wahiawa, is the largest on the west side of Koolau range. All the streams on the east side of Koolau range are short, but they have a good flow. Waianae is the principal stream from the Waianae mountains. What Oahu lacks in surface supply is largely made up from underground sources. Cane, rice, and taro are extensively irrigated on this island. Pine-apples require no irrigation.

"Transportation facilities are better on Oahu than on any of the other islands. A belt road crosses the Koolau range and the tableland between the mountain ranges, and a railroad extends almost completely around the island. It is thus easier to carry on field operations on this island than on the others."

SYNOPSIS OF THE SURVEY.

The survey of Oahu, as proposed, would have as its main lines of work the following:

1. A topographic survey, resulting in an accurate topographic map, showing contour intervals and all important physiographic features. This work has already been completed, but not made available, by the U. S. Army Engineer Corps.
2. A hydrographic survey, showing geographic and seasonal distribution of all waters. This work has been accomplished by the U. S. Geological Survey, as above referred to.
3. A geological and soil survey, mapping the important geologic formations and soil types. Much data is already available in the publications of various geologists (for exam-

ple, Hitchcock's "Geology of Oahu") and experiment stations, (for example, Maxwell's "Soils of Hawaii").

4. Compilation of climatic records from U. S. Weather Bureau, plotting the geographic and seasonal variation at representative stations.

5. Compilation of faunal and floral "locality records" from all available sources, and the plotting of zonal distribution of representative or "Key" organisms.

6. The formation of generalized statements and biologic laws.

The value of a survey of this kind, both scientific and economic, would be very great. Moreover it would be cumulative, the survey being a base record and guide for the continuation of similar scientific work. And lastly, such a survey would bring together in available and interpreted form a large mass of widely scattered, inaccessible and uncorrelated natural history data.

Forest fires in British Columbia covered more than 300,000 acres during the past year.

Mention is made in the forest notes issued to the press from Washington that there is a big market in Hawaii for box shooks for packing canned pineapple and pineapple juice.

There were 400 fires this year in the national forests of Utah, southern Idaho, western Wyoming, and Nevada, or 15 more than in the most disastrous season of 1910. Yet the cost of extinguishing them was only one-third and the damage only one-thirtieth of that of the earlier year. The difference is due to better organization now, and to more roads, trails and telephones.

It is said that the German invaders of Belgium, whatever else they may have destroyed, have been careful not to injure park trees. The cavalymen, so a report goes, are forbidden to tie their horses to trees for fear that the animals will gnaw the bark. Germany was the first nation to apply forestry on a large scale, some of the crown forests having been under scientific management for over a hundred years.

A surprisingly large number of substances, ranging all the way from the condensed fumes of smelters to the skimmed milk of creameries, have been tried or suggested as means of preserving wood from decay. Most of them, however, have been found to have little or no value for the purpose. Certain forms of coal-tar creosote and zinc chloride are the most widely used wood preservatives.

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A complete list of the publications of the Board available for distribution (together with the titles of certain issues now out of print) is to be found on the cover of the last biennial report.

Applications for publications should be addressed to the Mailing Clerk, P. O. Box 207, Honolulu, Hawaii.

DIVISION OF HYDROGRAPHY.

Rooms 20-22 Kapiolani Bldg. Tel. No. 3662.

The Division of Hydrography has on hand free publications relative to the water resources of the Hawaiian Islands. These publications furnish detailed data as to daily, monthly, mean, maximum, and minimum run-off of streams and ditches, and also cuts and maps pertaining to the different islands. Much descriptive data relative to the mountain ranges and physical configuration of each island are also contained. These publications will be mailed free of charge on request.

The United States Geological Survey topographic map of Kauai is also on sale, and copies will be mailed on receipt of 50 cents.

The records and maps of this division are available for inspection by any one who desires information relative to water resources, topography, etc. Blue print copies of hydrographic data relative to any stream, ditch, spring, etc., which may be under observation by this division will be mailed free of charge on request.

This division will also make ditch seepage losses and utilization investigations when the actual cost of the labor, materials, subsistence, transportation, etc., of such investigations is paid by those benefited.

G. K. LARRISON,
Superintendent of Hydrography.

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DIVISION OF FORESTRY.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

DAVID HAUGHS,
Acting Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications **SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.**

EDW. M. EHRHORN,
Superintendent.

THE HAWAIIAN FORESTER AGRICULTURIST

VOL. XII.

FEBRUARY, 1914.

No. 2

COYOTES SPREAD HYDROPHOBIA.

The spreading of rabies by infected coyotes among cattle grazing in the national forests has assumed a grave aspect, according to a report received by the forest service in Washington from the district forester in charge of the forests in Washington and Oregon. Numerous townships in eastern Oregon, it is reported, have ordered that all dogs be muzzled lest those that have been bitten by rabid coyotes develop hydrophobia and attack humans or domestic animals.

Efforts are being made by the state authorities of Oregon to stop the spread of hydrophobia by this means and officers of the forest service are coöperating in attempts to kill off the coyotes. In one county alone a loss of three hundred head of cattle is charged to rabid coyotes.

Besides the usual toll of pests intercepted the superintendent of entomology, with his report for last month, presents an encouraging statement of progress in breeding and distributing fruitfly parasites by Mr. Fullaway.

Dr. Norgaard's report for the closing month of last year shows the practical elimination of bovine tuberculosis on the Island of Oahu—the entire source of the capital city's milk supply—after a campaign by the division of animal industry extending over less than five years. This, too, has been accomplished with the unexampled obviation of any claim for compensation for reacting animals destroyed. Another gratifying fact in the report for December is that of the absolute suppression of glanders among horses and mules. Moreover, the effective control of hog cholera in the Territory indicated in previous reports is to be placed to the credit of the division.

In the April, 1914, number of the Forester an item about "electrified chickens" appeared, relating the success of electric incubators. Now we have electrified bees, in the following news

item from Chico, Cal.: "One of the latest proposals in the life of bee culture in this section is that of J. T. Dunn of Chico Vecino who has announced that he will use electricity for the development of queen bees, believing that in this way stronger queens can be secured. Dunn is an expert bee man, who recently came here from San Jose. He believes that Chico is one of the best bee sections in the state. Dunn is well known as a producer of queen bees and says that although he produces large numbers of them he is never able to fill the demand. He sends queens to all parts of the United States and some to foreign countries."

Professor Krauss, agronomist of Hawaii Experiment Station and now a homesteader on the Island of Maui, is quoted in the local press as intimating that the federal government, through its department of agriculture and with the coöperation of the war department, has a program for developing the agricultural resources of the Territory to the limit. This is good news, indicating that the long-desired day of the small farmer in Hawaii is about to dawn. In the meantime the successful continuance of the territorial produce agency, started a year or two ago in Honolulu, is a gratifying fact.

JANUARY MEETING OF BOARD.

A regular meeting of the Board of Agriculture and Forestry was held at the office of the president on January 28, those present being President Albert Waterhouse, Commissioners J. M. Dowsett and A. H. Rice; also C. S. Judd, executive officer.

The minutes of the December meeting were read and approved, and the routine reports of divisions were accepted.

ANIMAL INDUSTRY.

Regarding recommendation contained in Dr. Norgaard's December report that favorable action be taken in regard to Dr. Elliot's request for assistance in the matter of transportation in carrying on the tuberculin testing of dairy stock in the Hilo district, Hawaii, it was the sense of the meeting that the proposed extension of the work and its attendant expense, including the purchase of a Ford car, be delayed until appropriations are made by the Legislature. President Waterhouse recommended, however, that in the meantime the sum of \$300 be allotted Dr. Elliot for the period of six months ending June 30, 1915, for the purpose above named. Same was made a motion by Mr. Dowsett, seconded by Mr. Rice and unanimously carried.

President Waterhouse called attention to plans and specifications as submitted with Dr. Norgaard's December report for an animal shelter and hospital house at the local quarantine station at an approximate cost of \$200 exclusive of labor. It was there-

upon moved by Mr. Rice, seconded by Mr. Dowsett and unanimously carried that the above sum be allotted for such additional quarters. Those present agreed, however, that this sum be not exceeded, and the executive officer was therefore requested to keep informed as to the progress of the work.

REQUEST OF PROF. BRIGHAM.

Regarding request of Prof. W. T. Brigham, director of the Bishop Museum, for permission to explore government lands under the jurisdiction of this board for the purpose of collecting botanical and other scientific specimens, the chairman stated that the matter had been submitted to the Attorney-General whereby the request would be granted in accordance with the provisions of Chapter 63 of the R. L. of 1905, and of Section 3196 of said Revised Laws as amended by Act 26, Laws of 1909.

SPECIAL HYDROGRAPHY REPORT.

The president called to the attention of those present a special report from the Superintendent of Hydrography dated January 21, 1915, relative to seepage and ditch loss investigations, which work is being done in coöperation with the Sugar Planters' Association. Upon motion of Mr. Rice, seconded by Mr. Dowsett, said report was accepted and ordered filed for future reference.

President Waterhouse presented a special report from the Superintendent of Hydrography recommending that the Commissioner of Public Lands be requested to insert in all future leases of land where water is available certain data whereby the lessee is required to provide, install, maintain and operate such equipment as shall be approved by the Superintendent of Hydrography for the purpose of recording the flow of water on said land. Those present not being prepared to pass upon said recommendation, the matter was deferred and the secretary instructed to forward a copy to each member of the board for further consideration when same will be discussed at the next meeting.

The president stated that, as by communication from the Governor dated January 18, 1915, the sum of \$6500 had been allotted out of the revenue derived from water licenses under Act 57, S. L. of 1913, for salaries, payrolls, current expenses, equipment and construction work of the Division of Hydrography for the period ending June 30, 1915.

CLAIM AGAINST HILO SUGAR COMPANY.

President Waterhouse stated there was nothing new to report in connection with the claim against the Hilo Sugar Company for \$220 for lumber and iron removed from the premises of the old quarantine station at Punohoa, Hilo, Hawaii.

ADMISSION OF DOG.

In connection with request of Mr. E. S. Dam of Seattle, Washington, dated December 19, 1914, re the admission of a dog to the Territory of Hawaii without the four months' quarantine required by the local laws, in which instance the matter had been referred to Mr. J. K. Kalaniana'ole, Delegate to Congress, Washington, D. C., President Waterhouse read a letter to Mr. Kalaniana'ole in which the above request was refused, and stated he would like to have his action confirmed. Upon motion of Mr. Dowsett, seconded by Mr. Rice said letter was confirmed. The president also stated that Mr. Dam had been advised that his request could not be granted.

A. WATERHOUSE COMMISSIONED AS PRESIDENT.

Mr. Waterhouse advised those present that, as by commission from the Governor dated January 3, 1915, he had been commissioned as President of the Board, vice W. M. Giffard, resigned, Mr. Giffard, however, still retaining his commission as commissioner.

MILK INSPECTION.

A lengthy discussion arose regarding the present status of the milk inspection work and the appointment by the City and County of an unqualified man to act as such inspector. The president advised those present that he felt quite ready to abandon the tuberculosis control work as well as the milk inspection work pending the decision of the Legislature as to whether the milk inspection work would be continued by the County or the Territory. The draft of a letter was thereupon read by the president addressed to the Mayor and Board of Supervisors asking them to reconsider their appointment of Mr. Lot Lane as milk inspector and appoint Mr. Joseph Richard to such position; further stating that unless the personnel of the milk inspector is such that the officers of the board feel has the proper qualifications to act as such inspector, the coöperation previously existing between the Board of Supervisors of the City and County and the Board of Agriculture and Forestry would be discontinued. Upon motion of Commissioner Dowsett, seconded by Commissioner Rice, said letter was confirmed. Regarding the contemplated action of the board that publication be given once a month of the bacterial counts of the local milk supply together with the names of the producers, which matter came up for discussion at the December meeting, those present agreed that it would be advisable to defer same pending the decision of the Mayor and Board of Supervisors.

DIVISION OF ANIMAL INDUSTRY.

Honolulu, December 31, 1914.

The Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I beg to report on the work of the Division of Animal Industry for the month ending December 31, 1914, as follows:

BOVINE TUBERCULOSIS CONTROL WORK.

The testing of dairy and range cattle for tuberculosis came to a close with a few scattering cases of cows tested for transfer from one stable to another. Without wishing to anticipate the total results, as they are now being prepared for the biennial report of this Division, it may be mentioned that the outlook for complete eradication of this dangerous and destructive disease is very promising. On the Island of Oahu alone more than 7000 tests were made, yielding a total of 151 reacting animals, or slightly above two per cent (2.08%). Of these 151 reactors it is known that 113 have been killed, leaving only 38 tuberculous animals, of which number 31 belong to two parties who have them segregated miles away from their respective dairies, while less than half a dozen may be said to be segregated on the dairy premises where they were found, if that can be called segregation. In every case, however, with the possible exception of Geo. Holt's 13 reactors at Maili and Dr. Straub's two Brown Swiss cows (imported stock) retained on his premises, these animals will be killed as soon as they have calved.

The status at the end of 1914 may therefore be summed up as 15 known reactors still alive out of a total of 7231 tested during the year, which compares favorably with the first test made in 1910, which yielded 471 reactors out of 2095 tested (dairy cows whose milk was being sold) and the 1911 test which gave 225 reactors out of 4269 cattle tested.

While the actual figures for the past year have not yet been received from the other islands it is known that the total number of tests will far exceed 10,000 for the Territory, probably 12,000, which must be conceded a highly creditable performance when conditions and cost are considered. No country, state, territory or community ever destroyed ten per cent of its tuberculin tested reacting dairy animals without paying any indemnity to the owners (1300 head killed here from 1910 to 1914 inclusive), nor has such a volume of work (more than 25,000 tests) ever been performed in the same length of time and with an equal force of officers and men, except perhaps where our methods have been adopted. I do therefore not hesitate again to recommend that favorable action be taken on Dr. Elliot's appeal for assistance as

voiced in the enclosed correspondence. As will be seen it is not alone tuberculosis but also hog cholera that require his time and energy, two infectious and contagious diseases, the responsibility for which cannot be avoided by this Board. That glanders has been completely eradicated has to a certain extent diminished the fear of animal epidemics among the owners of large numbers of draft animals, which, in connection with the reduction in the number of these, resulting from the introduction of motor power, has already manifested itself in a considerable reduction in Dr. Elliot's income; and with the prospect of free sugar next year it may be further reduced. While Dr. Elliot mentions his official salary as \$150.00 per month, and considers it satisfactory, it must be borne in mind that the Hilo District is the only one where this official \$100.00 per month salary is still maintained, both Maui and Kauai insisting on lumping said salary with the veterinarians' pay for professional services. With the eradication of glanders in the Islands, there remains only the danger of introducing new cases of glanders with imported stock, for the inspection and quarantining of which the plantations can hardly be expected to pay.

The work now before us, as clearly set forth in Dr. Elliot's letters, consists chiefly in the eradication of tuberculosis and hog cholera, both of which diseases must go if the agriculturist is to make any kind of a success here. Dr. Elliot suggests that a Ford car be furnished him by the Board and its upkeep provided for, the scope of work he proposes to undertake and all of which has my unqualified support and approval, being fully explained in his letters; to which I can only add, that the Island of Hawaii is fortunate in having so able and energetic a district veterinarian, and the Board of Agriculture and Forestry equally so in being so unusually well represented on the big island.

A highly efficient milk inspection service has already been inaugurated in the Hilo district, by Dr. Elliot coöperating with the local Board of Health; in fact no local milk ordinance is in effect there, it being held that the Territorial Board of Health statute provides sufficient authority upon which to base and enforce efficient milk and dairy inspection, while the supervisors are glad to be relieved of this responsibility and expense.

THE HONOLULU MILK SUPPLY.

In regard to the action contemplated by the Board at its last meeting, that is, a periodical bacterial count of all milk produced here for human consumption, and the publication of such counts for the information of the milk consuming public, I have to say that the Division of Animal Industry can undertake the work at slight expense for additional apparatus and supplies, say \$10.00 per month. But whether to undertake this work which is strictly a milk inspection feature, required by the local milk ordinance

which stipulates the number of bacteria permissible in commercial milk, will, I take it, depend entirely upon the attitude of the new Board of Supervisors toward this Board, which is already doing, and has been so doing for more than four years, the most arduous work connected with the enforcement of said milk ordinance, that is, the tuberculin testing of all dairy cows. If to this is added the next most difficult work, viz.—the bacterial count, there remains little more to be done that this Division could not assume in conjunction with the sanitary inspectors of the Board of Health and the pure food inspector. If the new Board of Supervisors appoint a competent milk inspector and direct him to coöperate with this Division, that is, if they appoint the *only qualified milk inspector in the country*, Mr. Joe Richard, who, as they are well aware, has been carried on the rolls of this Board for the past two years in order to retain his services and further develop his ability and usefulness, then the milk inspection question is solved, and solved in the most economic manner possible, effecting a considerable cash saving to the Board of Supervisors, at the same time as placing the authority and responsibility under one head. Any other appointment will mean an impediment to the service and a complete disregard of what the public demand and are entitled to, and for which they certainly have been waiting long enough, that is, clean milk from healthy cows. Whatever milk and dairy inspection has been carried on during the past two years has been done by the Division of Animal Industry; every dairyman knows its officers and has confidence in them, and the very idea of an unproficient and inexperienced man attempting to enforce the milk regulations by the rule of thumb or by the printed word of the ordinance would prove either a farce or a tragedy, without getting one step closer to clean milk. But as I have already laid this matter before the President of this Board for his action, I only venture to hope for an equitable solution of the subject, that will not render useless the efforts of the Board and of this Division during the past two years for the end in view—clean milk from healthy cows. However, if the Board of Supervisors should not wish to coöperate with this Board as above suggested, I trust the Board will not require this Division to educate another milk inspector, which task would be equal to assuming the inspection work as hitherto. By the same token I should feel constrained to notify the Board that an ordinarily intelligent laborer will be sufficiently qualified to perform the duties required of a lay assistant in carrying on the tuberculin testing work, and that \$35.00 or \$40.00 per month may thereby be saved. However as Supervisor Mr. Dan Logan, who three years ago helped this Division by having the then city milk inspector, Mr. Richard, assigned to assist us in the cattle testing, which work in every way coincides and fits in with the milk and dairy inspection work, has now promised to lend his influence toward a similar arrangement, the two Boards dividing expenses,—salary and transportation,

—it would seem that a saving of at least \$50.00 per month for each Board would be welcomed under the present financial stringency, while duplication of work and, more than everything else, the increased cost of transportation be avoided.

ANIMAL QUARANTINE STATION.

I beg to transmit herewith plans and specifications for an animal shelter and hospital house such as has been contemplated ever since the endemic of last year, which resulted in the loss of nearly a dozen quarantined dogs. The inclement weather of the past month has made it imperative that such a house be provided for the protection and care of sick, delicate or otherwise susceptible animals, as well as for the safeguarding of valuable dogs during the night. The estimated cost of this house, with lockers for eight small dogs and five medium sized dogs, would amount to about \$200 exclusive of labor. It is however thought that the keeper and his assistant will be able to erect the house when there is nothing else to do, the same as they built the living rooms that were added to the keeper's cottage last year, especially so long as the lockers are made up at the planing mill.

On Dec. 30th, at 1:30 a. m., a whirlwind passed through the central part of the station, demolishing one of the largest feed and shelter racks and uprooting some algaroba trees (see pictures appended). Had this "twister" passed through the dog enclosure considerable damage would undoubtedly have resulted, both to buildings and animals. As it was several dozen corrugated iron sheets were torn from the rafters and purline and scattered all over the station, some of the sheets being recovered from the Ala Moana Road, where they barely missed injuring belated soldiers returning to Fort De Russy, while others were carried clear beyond the beach. These twisted sheets have been straightened and can nearly all be used again. The total damage is estimated at \$8.00 for lumber and lead head spikes and two or three sheets of iron.

Respectfully submitted,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, December 31, 1914.

Dr. V. A. Norgaard, Chief of Division of Animal Industry.

Sir:—I have the honor to submit herewith my report for December, 1914, as follows:

Tuberculosis Control.

The work in this line was confined to the testing and examination of one cow for Mr. J. H. Cummings.

A post-mortem was made on a grade Jersey heifer condemned at Waialae Ranch November 13, 1914. *Lesions*: Right retro-pharyngeal lymph gland greatly enlarged and filled with tubercles the size of lead shot. No other lesions were discovered.

The annual test for 1914 has been brought to a close and the results, as a whole, are exceedingly gratifying. The total number of tests made during the year amounts to 7231, which is over two thousand more than last year. Out of this number 151 head have been condemned and branded, and of these more than one hundred have been slaughtered, while the remaining ones are segregated and are being slaughtered as rapidly as possible.

The percentage of diseased animals found in the dairy herds during the year 1914 is 2.08%, which is a reduction of 1.81%, or almost one-half of the amount of disease found in 1913 which must be considered a long step toward the goal of total eradication.

IMPORTATION OF LIVE STOCK.

Manoa, San Francisco: 1 Berkshire cow, E. O. Hall & Son;
2 Angora goats, F. P. Johnson; 1 dog, Sergt. T. H. Matthews.
Sonoma, Sydney: 50 Merino rams, Parker Ranch.

Matsonia, San Francisco: 28 crates poultry.

China, San Francisco: 5 crates turkeys, Hind, Rolph & Co.

Hyades, Seattle: 1 crate poultry, E. W. Jordan.

Sierra, San Francisco: 2 crates poultry, K. & M.; 1 crate rabbits, 1 black cat, W. F. X. Co.; 1 crate pigeons, Mr. Lambert.

Lurline, San Francisco: 2 Berkshire boars, E. O. Hall & Son;
4 crates poultry, Chong Mon; 2 crates poultry, Dr. A. G. Hodgins;
1 Jersey bull, D. P. R. Isenberg; 1 horse, K. Miyahara;
1 horse, 1 Holstein bull, 34 mules, Schuman Carriage Company;
10 crates poultry, L. K. Smith.

Manchuria, San Francisco: 1 dog, Geo. I. Van Ness.

Wilhelmina, San Francisco: 2 crates rabbits, U. S. Experiment Station; 57 crates poultry.

Hilonian, Seattle: 50 Merino rams, 10 Shropshire rams, 2 Berkshire boars, Parker Ranch.

Mongolia, Orient: 1 crate poultry, J.

Shinyo Maru, Yokohama: 4 crates poultry, K. Machida.

Manoa, San Francisco: 29 crates poultry.

Niagara, Vancouver: 1 dog, Mrs. E. L. Tindall.

Respectfully submitted,

L. N. CASE,
Assistant Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

Honolulu, December 31, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the work performed by the Division of Entomology for the month of December, 1914, as follows:

During this month 42 vessels arrived at the port of Honolulu of which 23 vessels carried vegetable matter and two vessels sand.

<i>Disposal.</i>	<i>Lots.</i>	<i>Parcels.</i>
Passed as free from pests.....	1,311	29,851
Fumigated	9	1,393
Burned	49	114
Returned	6	138
Total inspected.....	1,375	31,496

Of these shipments 31,259 packages arrived as freight, 119 packages through the postoffice, and 118 packages as baggage of passengers and immigrants.

RICE AND BEAN SHIPMENTS.

During the month 8287 bags of rice and 3152 bags of beans arrived from Japan which after careful inspection were found free from pests and were passed for delivery.

PESTS INTERCEPTED.

Thirty-three packages of fruit and eight packages of vegetables were found in the baggage of passengers and immigrants from foreign countries. These were seized and destroyed by burning. 137 crates of Tangerines from Japan via Seattle and San Francisco were ordered returned to the shipper. These shipments came on the S. S. Wilhelmina December 22nd and the S. S. Ma-noa December 26th. As no fruit from Oriental ports directly or indirectly is permitted to land under Rule 1 of the Board of Agriculture and Forestry, I gave the consignees the option of either returning them to the shipper or of burning them. It may be interesting to note that after January 1, 1915, no citrus nursery stock, including buds, scions and seeds, can be imported into the United States or its Territories from foreign countries, under Notice of Quarantine No. 19 of the Federal Horticultural Board of the United States Department of Agriculture. This is owing to a dangerous disease of citrus plants known as the *Citrus Canker*.

Two packages of mistletoe from California had to be fumigated before delivery on account of being infected with the greedy scale (*Aspidiotus rapax*). In a small package of sunflower seed from Portugal one seed contained the larva of a *Tortricid moth*.

The following insects and other creatures were found in the packing and leaves of some birdnest ferns which were included in a shipment of orchids from Manila, P. I., on December 22:

Beetles: Four species of *Carabidae*, three species of *Staphylinidae*, one *Pselaphid*, one *Tenebrionid* and larva, one *Calandra oryzae*, one *Clavid*, one *Silvanus surinamensis* and one crushed beetle showing only wings. One Decay fly (*Drosophila* species), one *Reduvid* bug, four large slugs—*Vcrenacella* species with eggs. Several spiders, centipede, hilepods, pillbugs (*Onisona* species). Two species of ants (*etramorium guinsonse* and *Ponera* species), one house lizard (*Cooko* species) and three species of snails (2 *Kaliolla* species and 1 *Opesa* species). After fumigating the shipment thoroughly and going over each orchid they were passed, but all the ferns and packing were destroyed by burning. One lot of pine tree seeds from Japan was returned to the sender under the Federal Horticultural Board ruling that no plants or seeds shall be admitted into the United States or its Territories from foreign countries through the mails.

BENEFICIAL INSECTS.

Mr. D. T. Fullaway has continued with the breeding of the newly introduced parasites. During the month 7575 parasites were liberated in various places as reported by Mr. Fullaway in his report appended herewith.

HILO INSPECTION.

Brother M. Newell reports the arrival of nine steamers and one sailing vessel. Five steamers brought vegetable matter consisting of 192 lots and 3537 packages which were free from pests and were passed for delivery. The sailing vessel had lumber.

INTER-ISLAND INSPECTION.

During the month of December 67 steamers were attended to and the following shipments were inspected and passed:

Plants	u	68	packages
Taro		736	"
Vegetables		32	"
Fruit		3	"
		<hr/>	
Inspected and passed		839	"

The following packages were refused shipment on account of infestation or of having undesirable soil attached to the plants:

Plants	9 packages
Fruit	8 "
Vegetables	1 "
<hr/>	
Refused shipment	18 "

Respectfully submitted,

EDWARD M. EHRHORN,
Superintendent of Entomology.

FRUITFLY CONTROL.

Honolulu, December 31, 1914.

E. M. Ehrhorn, Esq., Superintendent of Entomology.

Dear Sir:—Permit me to report that at the close of the month of December all the parasites being handled in the insectary were doing well and no further losses have occurred. During the month we have produced the following numbers:

Diachasma fullawayi—69 females, 200 males.

Diachasma tryoni—4 females, 11 males.

Tetrastichus giffardii—6845.

Spalangia sp. —3.

Of these we have liberated as follows:

Diachasma fullawayi under tents—10 females with accompanying males in coffee fields at Maunawili Ranch, Oahu.

25 females and accompanying males in the coffee fields in Kona, Hawaii, in three separate one-fourth acre areas at Honaunau, Kealakekua and Holualoa respectively, the coffee on these areas being left on the tree unpicked.

Tetrastichus—500 liberated at Judge Cooper's, Manoa; 600 liberated on Mr. Damon's Moanalua Est.; 200 liberated at Maunawili; 200 liberated at Pearl City; 300 liberated at Kealakekua, Kona, Hawaii; 300 liberated at Honaunau, Kona, Hawaii; 300 liberated at Holualoa, Kona, Hawaii.

Opius humilis—250 liberated on Pacific Heights; 50 liberated at Pearl City.

Galesus—500 liberated on Gartley's Nuuanu property; 100 liberated at Pearl City.

The conspicuous feature of the work during this month was the retardation in development of the parasites due to the low temperatures experienced for about ten days in the middle of the month. This was felt at the time to be quite serious, but fortunately no harm has resulted and the emergencies which have taken place since have been larger than was expected.

The indications seem to be that the *Spalangia* brought from

West Africa is a true fruitfly parasite, and while on account of its slow development and low rate of parasitism it has been impossible to secure numbers large enough to warrant liberation in the open, it is felt that later on when our attention can be given exclusively to this insect, it will be possible to multiply it in large numbers, and everything going well, to get it established. While it evidently is a slow worker its attachment to the fruitfly alone makes it, in the writer's opinion, an extremely valuable parasite, and one that ought by all means to be established here if possible.

Very truly yours,

DAVID T. FULLAWAY.

DIVISION OF FORESTRY.

Honolulu, December 31, 1914.

Albert Waterhouse, Esq.,
Acting President and Executive Officer,
Board of Agriculture and Forestry.

Dear Sir:—I herewith submit a report of the principal work done during the month of December, 1914:

NURSERY.

Distribution of Plants.

	In seed boxes.	In boxes trans- planted.	Pot Grown.	Total.
Sold . . . . .	....	....	40	40
Gratis	500	1150	1698	3348
	<hr/> 500	<hr/> 1150	<hr/> 1738	<hr/> 3388

COLLECTIONS.

Government Realizations.

Collected on account of plants sold.....	\$.80
Rent of building, nursery grounds.....	35.00
	<hr/> \$35.80

Preservation of Forest Reserves.

On account of rent of premises Half Way House, Tantalus, for the months of Sept., Oct., Nov., and Dec., at \$10 a month	\$40.00
For the use of two acres of land, Pauoa Valley, at \$10 per acre per year, for Oct., Nov. and Dec.....	5.00
For use of land and gathering ti leaf, Pauoa Valley, \$50 per year, for Oct., Nov. and Dec.....	12.50
<hr/>	
Deposited with the Territorial Treasurer as a special fund and for the use of the Division of Forestry.....	\$57.50

PLANTATION COMPANIES AND OTHER CORPORATIONS.

The distribution during the month amounted to 20,000 seedlings and 500 assorted pot grown plants.

MAKIKI STATION.

The work has been principally routine in connection with the propagating and transplanting of trees. Our stock is considerably reduced and will require several months to get it up again.

HONOLULU WATER SHED PLANTING.

During the month 533 Koa and 125 Kukui trees were planted out. Other work done consisted of clearing off, making holes and hoeing.

ADVICE AND ASSISTANCE.

On December 17 the writer visited Water Reserve R at Pu-pukea and made arrangements with Mr. Mark Robinson, Jr., in regard to planting the tract with ironwood trees.

The trees are now ready at our Makiki station and will be forwarded when required.

At the request of a number of people in and around the city the writer has paid visits and given advice otherwise. The following gives the number of persons who have asked for advice and assistance: Visits made in and around the city, 12; by telephone, 14; by letter, other islands, 4; calling at nursery, 16; total, 46.

Very respectfully,

DAVID HAUGHS,
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

Honolulu, January 22, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operation of the Division of Hydrography during December, 1914, is submitted:

RAINFALL.

Dry weather continued during the month and with the exception of a large flood on windward Kauai on December 2 and 3d, which was the largest of the year, December was generally one of the driest months of the year. Partial rainfall records for the year seem to indicate that September was one of, if not, the wettest month on record in the Territory. Unfortunately shortage of funds caused the discontinuance of practically all of the high mountain rain gages, so that only fragmentary records are available. A few complete records are available at this time, and many others will be received in the near future. On Oahu the following total 1914 records are interesting:

Nuuanu Pali gage, elevation 1200 feet.....	140 inches.
Wahiawa, mauka, elevation 1250 feet.....	218 "
Wahiawa, makai, elevation 900 feet.....	41.2 "
Waianae at Makaha, elevation 1300 feet....	74.3 "

DITCH SEEPAGE INVESTIGATION.

The ditch efficiency investigation made at the sub-station of the H. S. P. A. Experimental Station, was completed and a report of the results obtained was forwarded to the Director of the Hawaiian Sugar Planters' Association Experimental Station on December 2, 1914. Additional investigation work of this nature was done in coöperation with the Hawi Plantation & Mill Co., and with the Kohala Ditch Co. on Hawaii. Copies of these reports are attached hereto. The coöperative investigation work with those plantations which have signified a desire for this work, will be started in January, 1915, and will include during the year the following plantations:

Oahu—Waialua Agricultural Co., Oahu Sugar Company, Ewa Plantation Co., and Honolulu Plantation Co.

Maui—Maui Agricultural Co., and Pioneer Mill Co.

Kauai—Kekaha Sugar Co.

It is considered probable that other plantations will take advantage of this work during 1915.

PUBLICATION OF DATA.

Approval has been received from the Director of the U. S. Geological Survey for the substitution of the *million gallon per 24 hours* unit in place of the *cubic foot per second* unit in all reports relative to Hawaiian water data. Future Hawaiian annual reports will cover fiscal years ending June 30, instead of covering calendar years as in the past. In order to make this substitution, no report will be issued for the calendar year 1914, but a biennial report for the period July 1, 1913, to June 30, 1915, will be issued. In the meanwhile, however, the past practice of furnishing blue print copies of data and information to all interested parties will be continued.

ENGINEERS CONFERENCE AT WASHINGTON, D. C.

The Superintendent attended and participated in the conference of engineers of the U. S. Geological Survey held at Washington, D. C., December 7 to 20th, 1914. At this conference the many conditions to be encountered, the best equipment to be used, and the most efficient methods to be employed on hydrometric investigation work, were discussed and many valuable papers were read covering these subjects. A number of the papers and discussions will be printed for preservation and distribution. The conference was attended by practically all of the hydrometric experts of both the United States and Canada, and by representatives of the three most important manufacturers of hydraulic investigation equipment. The representatives exhibited models of the latest and most improved instruments, etc. Addresses were made to the conference by the Secretary of the Interior, the Director of the U. S. Geological Survey, the Director of the Reclamation Service, and other prominent officials and hydraulic engineers and experts.

CHIEF HYDRAULIC ENGINEER, U. S. G. S.

The Chief Hydraulic Engineer of the U. S. Geological Survey received authority to visit this Territory, inspect the work done up to the present, and to confer with territorial officials relative to their desires as to the future policy and procedure of the work. It is expected that Mr. Grover will arrive about March 13th and remain in the islands until about May 5th. The entire expenses of this visit will be paid from a federal fund maintained for that purpose.

KAPAA HOMESTEAD WATER SUPPLY.

A reconnaissance was made of the Kapaa River on Kauai to determine the best location of proposed measurement stations to accurately determine the discharge of these two principal

branches of the river at points at or near the forest reserve line, and above all homesteads. Measurements made after a dry period of three weeks showed a discharge of about twelve million gallons per 24 hours.

KAUAI.

The entire month was spent on general improvement and measurement work. The defects of the 700-foot level windward stream stations which were uncovered by the recent floods, were rectified and a large amount of boulders and other materials with which the floods had choked the measurement sections was removed. Sixteen stream discharge measurements were made and nine rainfall stations were visited.

Conferences were held with the Manager of the Hawaiian Sugar Co. and with the President of the Lihue Plantation Co., and these officials agreed to maintain and operate all measurement stations within their respective jurisdictions in the future without cost to the government.

OAHU.

Forty stream measurements were made and two rain gaging stations were visited. The greater part of the month was spent by all employees in the Honolulu office in the preparation of data and reports. The station maintained by the Waiahole Water Co. above the north portal power house was discontinued as having served its purpose. Four measurements made at the station below the power house declared the fact that the tunnel discharge has remained practically constant for the past three months, at about 33 million gallons per day.

KAUAI.

Only routine operation work was done. All continuous water stage register stations were visited, instruments were inspected, and records secured. Two rainfall measurement stations were visited and the rainfall measurement station at Iao cave, elevation 1720 feet, was discontinued, as the records from this station have been almost identical with those obtained in the Iao tableland, elevation 1500 feet.

HAWAII.

Mr. C. T. Bailey, Acting Superintendent, spent December 3 to 7 on Hawaii, collecting data for the use of the Attorney-General to be used as evidence in the Hilo Boarding School ditch case.

KONA INVESTIGATION.

The report of the special investigation of North and South Kona for which the 1913 Legislature appropriated \$5,000.00 has been completed, and will be printed in January.

JANUARY PLANS.

Kauai.

The measurement station to be installed on the Olokele River in coöperation with the Hawaiian Sugar Co. will probably be completed. Should authority be received for the installation of the proposed Kapaa River measurement stations above the homestead trails, this work will probably be started. Routine gaging and maintenance work will be carried on as usual.

Oahu.

The special seepage and utilization investigation of the Wai-alua Agricultural Co. will be started, and plans will be developed for coöperative investigation work in connection with the Wai-ahole Tunnel Project and the Oahu Sugar Co. 1914 Hydro-metric data will be collected and prepared for publication and issued to those interested.

Maui.

Only operation and maintenance work will be done.

HAWAII.

Mr. C. T. Bailey, Assistant Engineer, will continue investigation work, and will appear as a witness for the government in connection with the Hilo Boarding School ditch case which will be heard at Hilo during January.

Very respectfully,

L. K. LARRISON,
Superintendent of Hydrography.

It is estimated that the government's Grand Canyon game refuge, in Arizona, now contains about ten thousand deer.

More than nine million young trees and ten thousand pounds of seed were planted on the national forests in 1914.

The government built more than two thousand miles of trail and three thousand miles of telephone line on the national forests in 1914.

FORESTRY AT PANAMA-PACIFIC EXPOSITION.

The forestry and forest products exhibit at the Panama-Pacific International Exposition will be shown in the Palace of Agriculture, which, with the exception of the great Palace of Machinery, is the largest exhibit palace of the exposition. The Palace of Agriculture covers an area of 328,633 square feet and was erected at a cost of \$425,610.

Group 134, under the official classification of exhibits, is divided into four classes of forestry exhibits comprising forest geography, maps, statistics and general literature, geographical distribution, botanical collections, seeds, bark, foliage, flowers, fruit, bark and wood sections. The planting, equipment and processes for tree collection, nursery practice, field planting and field sowing, make up class 661. Management and utilization, equipment and processes for protection from fire, insects and disease, organization of protective forces, ranger stations, trail and telephone systems, logging methods and equipment, transportation of logs and systems of cutting, comprise another.

The indirect use of forests, such as watershed protection, effects on climate and public health, prevention of erosion and shifting sand, use of windbreaks for recreation or as a refuge for game, is all considered in a separate class.

Forest products are exemplified in three classes: Lumber, equipment and processes used in cutting lumber logs into lumber, drying, dressing and grading of lumber and the rules for grading; saw-mill and planing-mill products for the manufacture of lumber; wagon-stock, cooperage, boxes, pickets, shingles, and doors. Veneering and veneering-cutting machinery will also be shown. Forest by-products—tanbark and extracts, naval stores, oils and distillates, charcoal, cork, dye-woods, medicinal and textile barks, kiln-dried wood, wood fuels and wood wool, occupy another class.

At least 25 per cent of the larch timber over large areas in eastern Oregon has been killed or weakened by mistletoe, and the forest service is taking steps to combat the pest.

Success has followed forest planting on the sandhills of Nebraska. Jack pines planted there by the government forest service ten years ago now have a height of over 15 feet and a diameter of 4 inches.

Increasing use of the national forests by local farmers and settlers to supply their needs for timber is shown in the fact that small timber sales on the forests numbered 8298 in 1914, against 6182 the previous year.

Osage orange wood is a source of dye and can be used to supplement the imported fustic wood, as a permanent yellow for textiles.

News print paper has been made by the forest service laboratory from 24 different woods, and a number compare favorably with standard spruce pulp paper.

The forest service is coöperating with 54 railroads, mining companies, pole companies, and cities in making tests of wooden ties, timbers, poles, piling, and paving blocks which have been given preservative treatment.

Recent sales by the government totaling 126,000,000 feet of sawtimber in the Olympic national forest, in western Washington, mark the opening of this hitherto inaccessible storeroom of timber, estimated to contain a stand of 33 billion board feet.

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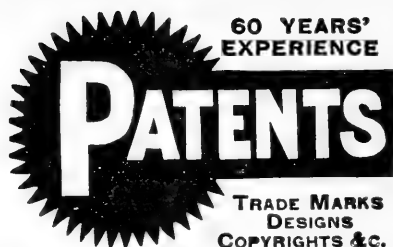
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Board of Agriculture and Forestry

PUBLICATIONS FOR DISTRIBUTION.

The Board of Commissioners issues for general distribution to persons in the Territory, annual reports, bulletins, circulars, copies of its rules and regulations, and other occasional papers, which may be had, free, upon application.

A complete list of the publications of the Board available for distribution (together with the titles of certain issues now out of print) is to be found on the cover of the last biennial report.

Applications for publications should be addressed to the Mailing Clerk, P. O. Box 207, Honolulu, Hawaii.

DIVISION OF HYDROGRAPHY.

Rooms 20-22 Kapiolani Bldg. Tel. No. 3662.

The Division of Hydrography has on hand free publications relative to the water resources of the Hawaiian Islands. These publications furnish detailed data as to daily, monthly, mean, maximum, and minimum run-off of streams and ditches, and also cuts and maps pertaining to the different islands. Much descriptive data relative to the mountain ranges and physical configuration of each island are also contained. These publications will be mailed free of charge on request.

The United States Geological Survey topographic map of Kauai is also on sale, and copies will be mailed on receipt of 50 cents.

The records and maps of this division are available for inspection by any one who desires information relative to water resources, topography, etc. Blue print copies of hydrographic data relative to any stream, ditch, spring, etc., which may be under observation by this division will be mailed free of charge on request.

This division will also make ditch seepage losses and utilization investigations when the actual cost of the labor, materials, subsistence, transportation, etc., of such investigations is paid by those benefited.

G. K. LARRISON,
Superintendent of Hydrography.

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DIVISION OF FORESTRY.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

DAVID HAUGHS,
Acting Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications **SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.**

EDW. M. EHRHORN,
Superintendent.

THE HAWAIIAN FORESTER AGRICULTURIST

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MARCH, 1915.

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FERNS OF HAWAII.

In the Philippine Journal of Science (Vol. IX, No. 5) appears a seven-page article entitled, "Hawaiian Ferns Collected by M. L'Abbé U. Faurie," by Edwin Bingham Copeland (from the College of Agriculture, University of the Philippines, Los Baños, P. I.). In his opening remarks the author states that, more than three years ago, M. Abbé Faurie placed in his hands a remarkably complete collection of the ferns of Hawaii, which he made during the years 1909 and 1910. In the course of the article the author mentions his having consulted the Brackenridge volume in the Bishop Museum, and says that Hawaiian ferns are represented in very considerable number in the herbarium of the Philippine bureau of science and in his own herbarium. "These specimens go back to collectors as old as Gaudichaud," Prof. Copeland says, "and include a considerable number collected and determined himself." Besides the plants he had himself collected on two personal visits to the mountains near Honolulu, he makes acknowledgments for specimens to the Bishop Museum, H. M. Curran (formerly of the Philippine forestry bureau), Dr. Bartsch of the United States bureau of fisheries and to the Hawaiian board of forestry. "In the older collections," the author says, "I have fortunately had an especially large representation of species of *Asplenium*, sent to me by the courtesy of the Royal Botanic Garden at Berlin."

In the Faurie collection, it is stated, there appear three cosmopolitan ferns not hitherto collected in Hawaii. These are: *Athyrium Esculentum* (Retz.) Copel., Kauai; *Adiantum Cunctatum*, L. & F., Faurie No. 154, Kauai, Kealia; *Pteris Longifolia* L., Faurie No. 45, Maui, Wailuku.

In descriptions of new species, with "the other changes of name which seem to be called for," the following designations appear: *Athyrium Marginale* (Hilleb.) Copel. comb. nov.; *Athyrium Mauianum* Copel. sp. nov.; *Athyrium Kaalaanum* Copel. sp. nov.; *Sadleria Fauriei* Copel. sp. nov.; *Asplenium Polyodon*

Forst.; *Asplenium Cookii* Copel. sp. nov.; *Asplenium Sectum* (Hilleb.) Copel. comb. nov.; *Asplenium Mirabile* Copel. sp. nov.; *Asplenium Nephrolephyllum* Copel. nom. nov.; *Elaphoglossum Crassicaule* Copel. sp. nov.; and *Lindsaya Macracana* (H. & A.) Copel. comb. nov.

Prof. Copeland mentions, besides Hillebrand's "Flora of Hawaii," a recent publication on Hawaiian ferns by W. J. Robinson. The following extracts from the treatise under review should be of local interest:

"The ferns of the Hawaiian Islands have probably received from Doctor W. J. Hillebrand more careful study than any man has ever given to those of any other limited area in the tropics. Lying as they do on a main route of the world's travel, the Hawaiian Islands have from early times been visited by many collectors, and for this reason, as well as because of the long sojourn of Doctor Hillebrand in the islands, their ferns are particularly well known. On the one hand, the admirable descriptions in Doctor Hillebrand's Flora make the study of these ferns easier than they would be if they came from almost any other part of the tropics. On the other hand, the ferns of Hawaii constitute in themselves a group of phenomenal difficulty. The isolated position of the Archipelago has resulted, in several genera, in the development of a flora altogether peculiar and local. Thus in the ferns, we have two genera, *Diellia* and *Sadleria*, each with a considerable number of species which have unquestionably been developed locally from a common ancestor. In both cases, the ancestor can be fixed with a considerable measure of certainty and exactness.

"The local development of a series of forms, which has taken place in the two genera just mentioned, has taken place also in the large genus *Asplenium*, apparently from a number of immigrant ancestral forms, and with the result that the derived groups have developed until they overlap, and the differentiation of groups, and the assignment of species and forms to the different groups, is only possible to a person who has something like the complete knowledge of the flora which Doctor Hillebrand possessed.

"In both *Asplenium* and *Sadleria*, I have ventured to describe new species, and in *Asplenium* I have raised some of his forms to specific rank. The most of the species which I describe as new in this paper are, I believe, plants which Doctor Hillebrand had not seen. It must be remarked that the Abbé Faurie is himself a collector of very long experience, that he is a good student of ferns, and that he devoted himself for about a year and a half wholly to the collection of the Hawaiian plants. Even in a land where the ferns have been as well studied as in Hawaii, it would be very strange if the Abbé Faurie had not succeeded in finding a number of previously unknown plants. In fact, knowing as I

do the work of Abbé Faurie, I consider the small number of new species which I can find in this collection almost as strong a testimonial as is Hillebrand's own work to the thoroughness with which Doctor Hillebrand has covered his field. Almost all of the species described by Doctor Hillebrand, and a wide range of forms which are not treated as species, are found in the Faurie collection."

TROPICAL PRODUCTS AS FOODSTUFFS.

Tropical Life (Londonā, discussing the European food situation created by the war, offers the following remarks:

"We are no believers in 'crank' foods, but it is no crank statement to say that, weight for weight, much nourishment can be obtained from sweet-potato flour, banana flour, and other fruits and vegetables produced in the tropics. The Rubber Growers' Association have been giving substantial money prizes to the man who can invent fresh demands for raw rubber on a large scale. Napoleon offered and, we believe, gave a big prize to the man who produced sugar from a source other than cane, viz., beet. Think, therefore, what a reward should be given to those who can come forward at times like the present and show us in Europe how to cheaply feed the million. Long before the last shot of this conflagration has been fired we may realize the mistake of being so dependent on other European countries, even for such things as eggs, bacon, butter (animal and vegetable), etc., whilst even eggs can nowadays be kept in the cold chamber for weeks, and so certainly for a sufficient number of days to enable them to be produced in huge quantities in the tropics and brought over here for consumption. This being so, why not do it? Compared to bread, the above may be semi-luxuries, but they are necessities too, and the supplies cannot be allowed to stop through war in these days of huge populations packed in small areas. Germany, we believe, is already exporting tons of palm-oil butter for human consumption, whilst the edible products she now manufactures from tropical raw materials, especially copra, are enormous: those from copra must equal if they do not exceed those of France. According to *The Financist* for July, Germany imported last year 195,000 tons of copra, against 45,000 tons only in 1906. This, therefore, shows an increase of 430 per cent in eight years; and if France has not increased latterly at the same rate that Germany has, it is only because she imported such huge quantities, comparatively speaking, before. In 1906 she took 128,000 tons; in 1912, 178,000; whilst last year her total has increased, but we have not the figures by us, and answers to our letters asking for them are not yet to hand. Imagine, therefore, the plight the households of the European middle and lower classes will soon

be in when, already pinched for money, they are further deprived of cereals, eggs, butter, etc., because of their inability to import supplies, to secure men to work the factories and of the reduced spending capacity of themselves; and although coco-nut butter is but one of several foods, it is important to keep up the supplies of this as well as of all foodstuffs."

In its January issue the *Agricultural News* (W. I.) gives a synopsis of Bulletin No. 47 of the Hawaiian Agricultural Experiment Station, on cold storage for tropical fruits.

"Hog Cholera Questions and Answers" is the title of Circular 54 of the agricultural experiment station of the University of Wisconsin. In a prefatory digest it is stated that the State of Wisconsin manufactures hog cholera serum to save her farmers from heavy losses, and the answer to the first question says that hog cholera is "the most dreaded scourge and reaps the greatest toll of any disease affecting domestic animals in this country to-day."

Attention is called to the announcement of his policy by the new superintendent of forestry, Mr. C. S. Judd, in this number.

Good work in all divisions is shown in the monthly reports printed in this number.

FEBRUARY BOARD MEETING.

The Board of Agriculture and Forestry met at the office of Mr. J. M. Dowsett at 11 o'clock a. m., February 26, those present being President Albert Waterhouse, Commissioners J. M. Dowsett, A. H. Rice and H. M. von Holt; also Executive Officer C. S. Judd.

Upon motion of Commissioner von Holt, seconded by Commissioner Rice, the routine reports from the Divisions of Forestry, Hydrography, Entomology and Animal Industry for the month of January, 1915, were accepted and ordered filed.

LETTER TO CITY AND COUNTY OFFICIALS RE WEATHER CONDITIONS.

Commissioner von Holt called especial attention to that portion of the routine report from the Superintendent of Hydrography relating to weather conditions, the small amount of rainfall during the month of January and the possibility of a shortage of water, and suggesting that same be called to the attention of the City and County officials as head of the water department. Those

present concurred, whereupon same was made a motion by Commissioner von Holt, seconded by Commissioner Rice and unanimously carried, and the executive officer directed so to do.

STUDY OF HAWAII'S WOOD REQUIREMENTS.

Chairman Waterhouse called to the attention of those present a recommendation contained in the report of the Superintendent of Forestry relating to Hawaii's wood requirements, the executive officer stating in brief that the demand for fuel wood in the Territory is so great and the supply so limited he thought every effort should be made to increase the supply by the encouragement of tree planting on unoccupied waste lands. His idea was to make a study of the annual consumption of fuel wood as well as the present source of supply with a view to later on having the data printed, the U. S. Forest Service having advised that they were willing to coöperate with the Board in every possible way. After a short discussion Commissioner von Holt moved that it be the policy of the Board to carry out the recommendations as contained in the January report of the Superintendent of Forestry under the head of "A Study of Hawaii's Wood Requirements"; same was seconded by Commissioner Rice and unanimously carried.

SPECIAL REPORT SUPERINTENDENT OF HYDROGRAPHY.

Regarding the special report from the Superintendent of Hydrography dated January 21, 1915, pending since the January meeting, in which it was recommended that the Commissioner of Public Lands be requested to have inserted in all future water and land leases certain data in order that a continuous record of flow and surface fluctuations of all streams, springs, etc., may be secured, Chairman Waterhouse requested further time to investigate the matter as he desired to take same up with the Governor and the Land Board.

RE ALLOTMENT OF \$700 FOR KAPAA STREAM, KAUAI.

Chairman Waterhouse advised that as per letter from the Governor dated February 25, 1915, he had approved of an allotment of \$700 for the purpose of covering the equipment and expenses incident to the installation of stream gaging stations to be established on the two main branches of the Kapaa stream, Kauai, by the Division of Hydrography during the six months period ending June 30, 1915.

APPLICATION T. M. BURRELL.

The chairman presented a special report from the Superintendent of Forestry dated February 24, 1915, regarding a verbal request which had been received from T. M. Burrell for permission to erect at the Nuuanu Pali, Honolulu Watershed forest reserve, a building which he desires to use as a store, the superintendent recommending that said request be not granted. After more or less discussion and those present concurring that a building at this point would be of detriment and would greatly detract from the natural beauty of the Pali, upon motion of Commissioner Dowsett, seconded by Commissioner von Holt and unanimously carried, Mr. Burrell's request was not granted.

RE INCLUSION OF 298 ACRES OF LAND AT KAPAPALA, KAU, HAWAII,
IN FOREST RESERVE.

Regarding a special report from the Superintendent of Forestry dated February 24, 1915, with which was submitted a communication from Messrs. C. Brewer & Company, dated February 2, 1915, recommending that a piece of land at Kapapala, Kau, Hawaii, between the mauka boundary of the cane land and the makai boundary of the present forest reserve, containing 298 acres, be taken into the Kau forest reserve; after considerable discussion the Commissioners unanimously approved of the general principle of creating as woodlot reserves unoccupied pieces of waste land which are not needed for homesteading nor for grazing purposes, as recommended in the Superintendent's report, but, regarding the inclusion of the 298 acres in the Kau forest reserve, it was unanimously voted upon motion of Commissioner von Holt, seconded by Commissioner Dowsett, that the Superintendent of Forestry be requested to make an investigation and forward a report as to the advisability of including this area in the reserve.

Fly larvae in horse manure may be effectively and economically destroyed by the use of commercial borax. According to Bulletin No. 118 of the Bureau of Entomology, United States Department of Agriculture, the application of 0.62 lb. of borax to each 10 cubic feet of horse manure was found to kill eggs and larvae, and it was also found that in the case of many crops the addition of this amount of borax was not detrimental when the manure was applied to the land. In order to prevent the hatching of the eggs, the borax should be applied to the horse manure immediately it is removed from the stable. The maggots congregate about the edge of the manure pile, and on this account most of the borax should be applied in this situation.—*Agricultural News*.

DIVISION OF ANIMAL INDUSTRY.

Honolulu, January 31, 1915.

Board of Commissioners of Agriculture and Forestry, Honolulu,
T. H.

Gentlemen:—I beg to report on the work of the Division of Animal Industry for the month of January as follows:

TUBERCULOSIS CONTROL WORK.

The regular annual test for 1915 began by the injection of a large herd of cattle never before subjected to the test and which it had for a long time seemed desirable to include in the regularly tested herds, as it was well known that the disease was prevalent not only among the milch cows but in the entire herd. While this herd includes 325 head it cannot be considered a regular dairy herd as no milk is sold and, consequently, no license required, but nevertheless a number of families, both in the vicinity of Kualoa and in Honolulu, obtain their milch cows from this ranch.

The results of the first test showed conclusively the necessity for universal testing if total eradication of tuberculosis is to be accomplished, as nearly ten per cent of this herd gave typical reactions. As much of the milk from these animals is consumed by children there was every reason why the diseased animals should be eliminated.

As will be seen from the appended report of Dr. Case, the postmortem examination of eight of the reacting animals showed the disease in more or less advanced stages, three of them being affected to such an extent that it was necessary to condemn the entire carcass as unfit for human consumption. One of these totally condemned cows was suffering from tuberculosis of the udder.

In regard to the test of the Waialae herd, where every effort is being made to eradicate the disease, the percentage of reactors appears to be greatly reduced and since the reacting animals are now being promptly removed it may safely be concluded that the next test will show few, if any, reactors.

HOG CHOLERA.

As mentioned in my last report Mr. P. M. Pond imported from Oregon a large herd of hogs, about 400 head, more than half of which were brood sows, his intention being to utilize the swill from Schofield Barracks in the production of pork. The only deterring feature in this enterprise would seem to be hog cholera, but as the commercial vaccine now on the market appears to be, in this Territory at least, an almost infallible preventive, and as

the hitherto almost prohibitive price has now been reduced to about one-third of what it used to be, it may reasonably be surmised that, even if vaccination becomes necessary, little loss will be experienced from this disease.

Whether the vaccine as claimed by some, does not absolutely protect against hog cholera unless injected simultaneously with a small amount of a virulent virus, it has been decided not to risk the introduction of a highly virulent and fatal type of hog cholera such as would be required for the purpose, but to resort to vaccination only in herds where the disease has actually made its appearance. Considering the apparently mild type of infection we have to deal with here, this method would seem all that is necessary to completely control and eventually eradicate this disease.

From the Island of Hawaii Dr. H. B. Elliot reports the importation of one mule and one crate of poultry.

The tuberculosis control work is progressing very favorably and the continued efficient coöperation of the Board of Health is assured. During the past month a total of 424 animals have been tested out of which number 11 have been condemned. These condemned animals have been segregated awaiting slaughter.

Respectfully submitted,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, January 31, 1915.

Victor A. Norgaard, Chief of Division of Animal Industry.

Sir:—I have the honor to submit the following report for the month of January, 1915:

TUBERCULOSIS CONTROL.

The following dairy herds received the tuberculin test:

	T.	P.	C.
Kualoa Ranch	328	303	25
C. H. Quinn	4	4	0
Waialae Ranch	420	405	15

A total of 752 dairy cattle were tested with the result that 712 were passed and 40 condemned and branded. An opportunity was given to make post-mortem examinations on eight of the 25 animals condemned at Kualoa Ranch, the results of which are as follows:

No. 1. Red and white grade durham cow; reaction large. Lesions: Nodules in the mediastinal glands and diaphragmatic lobes of both lungs. The costal lobe of the right lung contained a large abscess which discharged into one of the bronchi.

No. 2. Holstein cow; reaction medium. Lesions: Both pharyngeal glands greatly enlarged and filled with tuberculous material; mediastinal glands 6"x4" in size and contained cheesy and calcareous material; the entire lungs filled with masses of tuberculous tissues; right costal pleura and pulmonary surface covered with grape-like bunches of tuberculous tissue; liver filled with nodules in the size of a dime. The carcass was condemned entire.

No. 3. Red and white durham cow imported from California; reaction medium. Lesions: The same as in No. 2 with the addition of one mesenteric gland and the supra-mammary glands and udder affected. The carcass was condemned entire.

No. 4. Holstein cow; reaction large. Lesions: One mediastinal gland double the normal size contained a few small nodules.

No. 5. Holstein cow; reaction large. Lesions: Nodules in the mediastinal glands and diaphragmatic lobes of both lungs.

No. 6. Holstein cow; reaction medium. Lesions: Semi-calcareous nodules in the right retro-pharyngeal gland.

No. 7. Red and white grade durham cow; reaction large. Lesions: A few small nodules in the left retro-pharyngeal gland; a few nodules the diameter of a silver quarter in the diaphragmatic lobe of the right lung.

No. 8. Holstein cow; reaction medium. Lesions: Numerous and various sized nodules in both retro-pharyngeal glands, mediastinal glands, diaphragmatic lobes of both lungs and one mesenteric gland. The carcass was condemned entire.

The above post-mortem examinations demonstrate the accuracy of the intradermal test and its ability to pick out those cases of extreme generalized tuberculosis, many of which would probably show no reaction to the subcutaneous test.

IMPORTATIONS OF LIVE STOCK.

Matsonia, San Francisco: 1 crate rabbits, W. F. X. Company; 6 crates poultry, Barrere Sales Co.; 3 crates poultry, Chang Brothers.

Lurline, San Francisco: 5 polo ponies, Alexander & Baldwin; 8 crates poultry, Barrere Sales Co.; 1 Guernsey cow, College of Hawaii; 2 crates poultry, Chang Bros.; 1 Berkshire boar, E. O. Hall & Son; 24 mules, Hawaiian Pineapple Co.; 7 crates poultry, L. K. Smith; 34 mules, 1 horse, Schuman Carriage Co.; 12 mules, T. H. Davies & Co.; 2 dogs, 1 crate rabbits, W. F. X. Co.; 2 horses, Gen. J. F. Wisser; 1 horse, Lt. L. D. Baker; 1 dog, Lt. W. F. Winton; 2 dogs, Sergt. Brobson.

Mongolia, San Francisco: 1 white leghorn cockerel W. F. X. Co.

Wilhelmina, San Francisco: 12 crates poultry, Barrere Sales Co.; 10 crates poultry, Chang Bros.; 1 crate turkeys, E. O. Hall & Son; 12 crates poultry, L. K. Smith; 5 crates poultry, C. C. von Hamm; 6 crates poultry, Chong Wah; 1 crate rabbits, 1 crate poultry, 1 can gold fish, W. F. X. Co.

Hyades, Seattle: 1 crate bd. plymouth rocks, J. A. Coombs; 2 Hampshire cows, 1 Hampshire boar, H. C. & S. Co., Kahului.

Columbian, Seattle: 590 hogs—(390 for breeding purposes, 200 for slaughter); 9 horses, 4 cows, grades; 1 calf, grade; 2 crates poultry; A. L. McPherson.

Manoa, San Francisco: 10 crates poultry, Barrere Sales Co.; 1 crate poultry, Chang Bros.; 4 crates poultry, J. F. Podmore; 10 crates poultry, L. K. Smith; 7 crates poultry, Sing Sing Co.; 1 crate poultry, H. H. & Co., Lihue.

Respectfully submitted,

L. N. CASE,
Assistant Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

Honolulu, January 31, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the work performed by the Division of Entomology for the month of January, 1915, as follows:

During the month 40 vessels arrived at the port of Honolulu of which 24 carried vegetable matter.

<i>Disposal.</i>	<i>Lots.</i>	<i>Parcels.</i>
Passed as free from pests.....	1,017	23,271
Fumigated	1	1
Burned	36	40
Returned	1	1
<hr/>		<hr/>
Total inspected.....	1,055	23,313

Of these shipments 23,061 packages arrived as freight, 155 packages through the postoffice and 97 packages as baggage of passengers and immigrants.

RICE AND BEAN SHIPMENTS.

During the month 23,038 bags of Japanese rice, 155 bags of Chinese rice and 1762 bags of Japanese beans arrived from Oriental ports which after careful inspection were found free from pests and were passed for delivery.

PESTS INTERCEPTED.

Thirty-one packages of fruit and 5 packages of vegetables were found in the baggage of passengers and immigrants from foreign countries. All were seized and destroyed by burning. In one package of juniper seeds from Japan arriving by mail were found larvae of a *Tortricid moth*. The seed was fumigated before delivery. A passenger from Japan brought a dwarf ornamental thuga tree on which all the soil had to be removed. In this soil were found twenty-one grubs of a small weevil. It is the same species which has been found in soil on plants from Japan before and which is reported as being a serious pest on pot plants in that country. Two bundles of Christmas greens were taken away from a passenger on account of being infested by scale insects (*Phenacaspis eugeniac*). These greens came from Sydney, N. S. W., and were intended to be landed in the Territory.

BENEFICIAL INSECTS.

Mr. D. T. Fullaway has continued with the breeding of the various parasites for the fruit fly and horn fly. During the month many parasites have been distributed in various sections as shown by his report attached hereto.

HILO INSPECTION.

Brother M. Newell reports the arrival of six steamers and two sailing vessels. Four steamers brought vegetable matter consisting of 163 lots and 2,729 packages. Out of this number twenty sacks of potatoes were returned to the shipper on account of being infested with potato scab.

INTER-ISLAND INSPECTION.

During the month of December 61 steamers were attended to and the following shipments were inspected and passed: Plants, 91 packages; taro, 532 bags; vegetables, 58 packages; fruit, 1 package; total, 682 packages.

The following packages were refused shipment on account of infestation or of having undesirable soil attached to the plants: Plants 14 packages; fruit, 2 packages; total, 16 packages.

Respectfully submitted,

E. M. EHRHORN,
Superintendent of Entomology.

FRUITFLY CONTROL.

E. M. Ehrhorn, Esq., Superintendent of Entomology.

Sir:—I submit herewith my report on the operations of the insectary during the month of January, 1915:

Propagation.

Diachasma fullawayi—355 females, 710 males.

Diachasma tryoni—13 females, 26 males.

Tetrastichus giffardi—15,025.

Spalangia sp.—18.

Liberation.

Diachasma fullawayi—205 females and accompanying males.

Tetrastichus giffardi—13,100.

Of the *Diachasma* 135 were liberated in the Kona district of Hawaii, and 70 at Maunawili Ranch, Oahu; of the *Tetrastichus* 10,000 were liberated in Nuuanu Valley, Honolulu; 900 in the Kona District, Hawaii; 1,000 in the Hilo District, Hawaii; 800 near Lihue, Kauai, and 400 at Moanalua Gardens, Honolulu. All the specimens of *Diachasma tryoni* and *Spalangia* have been retained for further multiplication.

The number of pupae handed during the period corresponding to the above emergence was 31,516 for *Diachasma fullawayi* and 6,210 for *Tetrastichus giffardi*. The percentage of parasitism estimated on these figures is 3% for the former and 16% for the latter.

Respectfully submitted,

D. T. FULLAWAY.

EXECUTIVE OFFICER'S REPORT.

Honolulu, February 23, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I have the honor to submit as follows my first routine report as Executive Officer of the Board for the month of January, 1915:

On January 16, the day after my return to the Territory, I began work at the office of the Board at the Government Nursery, King street. After several days spent in getting re-acquainted with the routine work of the board and in consultation with your president I ascertained that the most pressing work of the board was the preparation for publication of the biennial report and the making and delivery of an inventory of all of the property of the Territory under the board's jurisdiction. A large share of my time, therefore, was spent on these two important projects during the balance of the month, and on the last day of January both of them were on a fair way toward completion.

Respectfully submitted,

C. S. JUDD,
Executive Officer

DIVISION OF FORESTRY.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I have the honor to submit as follows my first monthly routine report of the Division of Forestry for the month of January, 1915:

On January 16, the day after my return to the Territory, I took up the work of the division, which since the resignation of my predecessor, Mr. Ralph S. Hosmer, on September 1, 1914, has been in the care of the forest nurseryman, Mr. David Haughs, who has served as Acting Superintendent of Forestry.

The first few weeks were necessarily spent in picking up the threads of the work and in getting acquainted with the routine of the Division of Forestry. In addition to this, I found it necessary to spend a considerable portion of my time in January as executive officer of the board on two matters which were of paramount importance, viz., the preparation of the biennial report for publication and the making of an inventory of all of the board's property. Consequently, during the two weeks of tenure of office in January no very important matters occupied my attention as Superintendent of Forestry with the following two exceptions:

GRASS CUTTING ON NUUANU WATERSHED.

On January 26, an application was received to cut grass on the Honolulu Watershed forest reserve in Nuuanu Valley in the region of Luakaha. In view of Forestry Rule 1 which was passed by the board and approved by the Governor on August 22, 1914, and which prohibits such cutting without permit, the application was denied, at least pending further investigation. At the same time it was called to my attention that certain grass cutting was going on in the reserve, especially near the Nuuanu reservoir. I have made a preliminary investigation of the matter, the solution of which will doubtless involve, in part, coöperation with the County and possibly also with the Board of Health, and as soon as my investigation is completed I am sure that the matter will be adjusted in a manner which will be satisfactory and which will safeguard the purity of Honolulu's water.

PERMIT TO REMOVE STONES.

During the month an application was received for permission to remove ten (10) cubic yards of stone from the Honolulu Watershed forest reserve in Makiki. After a personal investigation with the applicant on the ground, and consultation with the president, I issued, on January 27, a permit for the removal of the material, within six (6) months, from a designated spot in the valley bottom near the lower boundary of the reserve, where the removal of stone will be a benefit rather than a detriment to the land.

POLICY.

At the inception of my work as Superintendent of Forestry I wish to take this opportunity to express my strong belief in the established policy of the board of rigid protection of the indigenous Hawaiian forests for the purpose of water conservation and to assert that it will give me great pleasure, with the means at my disposal, to uphold and carry out this policy. The work of greatest importance at present appears to be the securing of this protection to the forests by means of fence construction on the boundaries of the forest reserves where it is needed and this will receive my early and diligent attention.

STUDY OF HAWAII'S WOOD REQUIREMENTS.

The paramount value of the forest reserves of native Hawaiian forests lies in their function of conserving the sources of water supply and equalizing the run off and it is of the greatest importance that this function should be continued and developed through

protection and forest extension. This means that the indigenous forests must be protected from all trespass whatsoever, and that where they are of any value as water conservators, no cutting of timber can be allowed in them. Regardless of what takes place outside the native forest reserves at lower elevations, the necessity of the absolute protection of our reserves of indigenous forests must be kept uppermost in mind.

At the same time the crying need in the Territory for fuel wood must necessarily be heeded. The days when the native forest was cut for this purpose, with destructive results, have almost completely passed, and if it had not been for the timely introduction and natural spread of the algaroba, the people of the Territory would today be badly off for fuel wood. As it is, however, the demand for fuel is today so great that the price of \$14 per cord for algaroba wood delivered in Honolulu is higher than under ameliorated conditions it should be and the plantations and other companies find their fuel wood bills a very large item of expense. The rapid increase in the population of the islands due to the advent of several branches of the military service and other reasons bids fair to make the demand for fuel wood still greater in the very near future.

It therefore appears appropriate that your Division of Forestry should look into the situation carefully and lend every effort toward its amelioration. The present annual consumption of fuel wood and present source of supply should be thoroughly investigated and a study made of the means of increasing the supply by the encouragement of tree planting on present unoccupied waste lands. This, with your approval, I propose to do at the earliest opportunity by making an investigation in the Territory along lines which are similar to those used by the U. S. Forest Service lately in studying the wood using industries in about 36 of the States of the Union in coöperation with State Foresters and other similar officials. The results of these studies, which have been published in bulletins, have proved to be of great value for they indicate among other things the relation of the forests to the industries of the State. Copies of these bulletins are in my office available for inspection at any time. A similar study made by the U. S. Forest Service recently in Porto Rico, brought out the fact of the great demand for fuel on that island and I anticipate that a similar study in these islands will result in findings of the same nature.

Practically the only cost in connection with this study would be the publication of the results, which would amount to a few hundred dollars, for the U. S. Forest Service, with which I still retain a connection as collaborator, has informed me that they would be glad to coöperate with this board in the study in every possible way. Much of the investigation would be carried on by mail to be followed up later by a personal interview of those who

were delinquent in their replies. In making these studies on the mainland the U. S. Forest Service has furnished letter and reply forms and franked envelopes, which require no postage, and I am sure the Service would be glad to coöperate with this board to this extent and possibly in still other ways which may suggest themselves as the study progresses.

The making of this study will doubtless bring out all of the facts needed to formulate plans for relieving the fuel situation in the Territory and other points concerning wood production of related value will be brought to light in the investigation.

Your approval of this project along the above lines, in coöperation with the U. S. Forest Service, is respectfully requested.

Respectfully submitted,

C. S. JUDD,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

C. S. Judd, Esquire, Superintendent of Forestry.

Dear Sir:—I herewith submit a report of the principal work done during the month of January:

NURSERY.

Distribution of Plants.

	In seed boxes.	In boxes trans- planted.	Pot Grown.	Total.
Sold	500	500	30	40
Gratis	1000	5150	2088	8238
	<hr/> 1000	<hr/> 5650	<hr/> 2118	<hr/> 8768

COLLECTIONS.

Collections on account of plants sold \$6.65

PLANTATION COMPANIES AND OTHER CORPORATIONS.

The distribution of plants under this heading amounted to 6000 in seed boxes, 3000 in transplant boxes and 1300 pot grown, total 10,300.

MAIKI STATION.

The two men at this station have been kept busy transplanting and potting trees, also mixing and sterilizing soil. It will take

several months to get a good stock again. The great demand for trees during the past three months has reduced our stock considerably, but we are gradually building it up again.

HONOLULU WATERSHED PLANTING.

The work on the watershed planting is progressing satisfactorily and the late rains have again soaked the ground so that the planting can go on without interruption.

During the month of January 220 koa and 60 kukui trees were planted. Other work done consisted of hoeing and clearing away the weeds from the small trees, also clearing off and making holes.

ADVICE AND ASSISTANCE.

At the request of people in and around the city the writer made eight calls, answered nine inquiries by telephone, gave advice to ten people calling at the nursery and answered six requests by letter from the other Islands.

Respectfully submitted,

DAVID HAUGHS,
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

Honolulu, February 12, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the Division of Hydrography during January, 1915, is submitted.

WEATHER CONDITIONS.

The month was the driest for the past ten months,—the rainfall being very small on all islands. Streams are again approaching minimum discharges, and the water shortage is beginning to be felt in many places. On Oahu the Schofield Barracks and Castner supply which is obtained from the Kaukonahua Stream, is seriously depleted. Honolulu should prepare for the possibility of another period of dry weather during which her water supply should be carefully conserved.

KAUAI.

Only maintenance and routine operation work were done. All māuka stream and rainfall stations were visited and were left in first-class condition. Conferences were held with plantation

officials relative to coöperative work, and as a result new equipment will be established on a number of distribution weirs, the records of which determine the amounts paid for water by several plantations.

Equipment for two continuous record measurement stations on the two main branches of the Kapaa River above all diversions, and homesteads, has been ordered and these stations will furnish run-off data of the Kapaa river which will be of great value to homesteaders and to the Territory, in adjusting future water distribution.

OAHU.

The greater part of the month was spent on office work, including the collection and working up of 1914 discharge, and rainfall data. All measurement stations were visited, and twenty-three measurements were made.

A provisional estimate of the flood discharge of the Malaekahana and Kahawainui streams for 1913 was prepared, and furnished to the Kahuku Plantation Co.

The channel at the measurement station established to measure the water developed in the east end of the Waiahole tunnel had become so changed by floods that it was no longer suitable for its purpose. It was discontinued on January 1, and a new site selected at a lower elevation. The Waiahole Water Company has agreed to pay the entire cost of establishing a clock register station at the new site, and a Gurley register has been ordered by cablegram for this station. The station will probably be completed by April 1, 1913. A series of measurements showed the outflow from the tunnel on January 22 to be 32 million gallons per 24 hours.

The special seepage and utilization investigation of Waialua plantation was started on January 25, and will be completed in February.

MAUI.

Only two days were spent on Maui during which 1914 run-off and rainfall data were collected from coöperating parties.

HAWAII.

C. T. Bailey, assistant engineer, spent January 4 to 18 on Hawaii gathering data relative to the discharge of the Wailuku stream and its diversions, and acting as a witness for the Territory in the Hilo Boarding School ditch case.

H. A. R. Austin, junior engineer, spent January 1 to 4th collecting stream flow data relative to the Waiakoloa stream near Waimea, and working ditch seepage measurements at Kohala.

SPECIAL KONA REPORT.

This report was completed and was sent to the printer on January 25. Three hundred copies will be available about February 20.

Very respectfully,

L. K. LARRISON,
Superintendent of Hydrography.

GOLDEN FINGERS.

The Story of the Banana.

The golden apples of the Hesperides have ever held a fascination for children—young and old—we are all of us familiar with the stories of that wonderful golden fruit, luscious beyond all others, and possessed of magical powers of nourishment.

Though incurable "matter-of-fact" people try to convince us that the golden apples were nothing but oranges, fairy fruits in a fairy garden they will always remain to the rightminded.

But fairy land is a long way off, and as we get older it grows more and more difficult to get there. After all, the golden apples were not of much use to ordinary folk; they were kept away from the confines of the garden by a dragon. It was only the very cunning or the very strong who succeeded in plucking the spoil.

Cheap Nourishment of Millions.

The golden-fingered fruit of today has no such limitation. The banana is open for the world to pluck, and offers cheap nourishment to millions. In comparison with it, the value of the fabled golden apple sinks into insignificance. If ever there were a true fairy story it is that of the banana.

The banana (*Musa Sapientum*) and the plantain (*Musa Paradisiaca*)—it is impossible to draw a line of distinction between them—are widely spread over the whole of the tropics, both of the western and eastern hemisphere, but develop better in the West than in the East.

How the Banana Grows.

The term "tree" is scarcely accurate as applied to the banana. What is termed the stem, which is from 8 to 12 feet high, is in reality compound and convolute sheaths of leaves over each

other. The flowers spring up through the center of this sheath-stem, in the form of spikes, along which the flowers are arranged.

It is easily propagated by suckers, and grows in almost any soil except sand or one composed of calcareous matter. A mean temperature of 65° to 68° Fahr. is suitable for the cultivation of the bananas, but the plantain requires at least 3° more.

The young suckers will bear fruit in about a year, each sucker producing fruit weighing from 25 to as much as 90 lbs. Unlike the coconut or cocoa tree the plantation is not a permanent one, and must be regularly renewed with young plants.

The Nutritive Value of the Banana.

The celebrated Humboldt stated that "one acre under plantains yielded as much nutritious food as 144 acres under wheat." A startling statement indeed, yet one that is now accepted as correct by those whom experience of the culture has qualified to judge.

The banana's value as a food is, naturally, what first engages our attention. In this connection it is impossible to over-state its importance to the native of the countries in which it grows. The native may plant a sucker from an old tree in the moist bank of some river and at the end of ten months gather the first crop. The year following the clusters may weigh 60 pounds each. No wonder the native finds no necessity to exert himself, but, in many instances, relies upon the banana solely for his sustenance. The nourishing qualities of the fruit are now fully established, and it can be taken when food of any other kind is inadvisable. The growth of the banana in popularity in this country has been phenomenal. Those of us who have reached middle age can remember well the first tentative introduction into the fruiterer's shop. For some time the imports increased only slightly. People did not understand the fruit; the fact that it should be consumed only when fully ripe was hardly known, and even the condition of ripeness was mistaken for one of decay. With better knowledge of the banana, however, its popularity grew apace until the imports today are estimated to amount to the value of \$10,000,000.

Trade Still In Its Infancy.

Notwithstanding this immense body of imports of bananas, it is impossible to come to any other conclusion than that the banana trade in this country is still in its infancy. The plant is so fecund, it grows with such luxuriance and is so easy of cultivation that there seems to be no limit to production. As regards the consumer's side, the need of a cheap, wholesome and nourishing food, in London alone, is notorious and urgent. Every day sees the popularity of the banana increase and spread, every day its

circle of consumers widens and brings recognition of its merits to fresh purchasers.

There can be no mistake about it—bananas are a new food thoroughly established in the favor of a large section of the populace, growing steadily in popularity and with a certainty of future consumption to which it is not easy to estimate a limit.

Subsidiary Uses.

Apart from its prime use, as a food, the banana has by-products of very considerable value.

The sap has important use as a mordant in dyeing.

The fibre of one tree will furnish 4 lbs. material for paper and textile fabrics.

The top of the stem makes good ink.

The flour of the plantain is highly esteemed in the West Indies as a food for invalids and children, and indeed for this purpose is regarded as distinctly superior to arrowroot.

Experiments are now proceeding with the skins for the production of dyes, and with the "rejects" for the manufacture of flour. *Invest in the Tropics (London).*

ARTIFICIAL MILK.

A discovery which should prove of great interest to housewives and mothers has recently been brought to perfection in a London chemical laboratory. This is a process of manufacturing synthetically a pure and wholesome milk of high nutritive value, possessing all the virtues of the original article but none of its many dangers.

The discovery originated many years ago as the result of the ingenuity of a Chinaman who saw a possible substitute for milk in the native drink prepared from the soya beans. His efforts, however, met with only partial success owing to the fact that the fluid prepared by him had an exceedingly penetrating and—to Western palates—disagreeable taste. It was left to a German chemist to lay the foundations of the present synthetic milk by suggesting a composite fluid, made up of all the ingredients of cow's milk in correct proportion.

This suggestion was widely discussed about two years ago, but the many obvious difficulties standing in the way of its realization caused the public to regard it more as a dream than a possibility. One or two chemists, however, attracted by the idea, continued to work at the subject, with the result that synthetic milk is now an accomplished fact!

TASTE OF THE NEW MILK.

The fluid (says the Times), as far as its appearance is concerned, is quite indistinguishable from rich cow's milk. It is delightfully smooth on the palate. On the other hand, the taste seems to some persons slightly different from that of ordinary milk. It is said that even this slight "taste" can be removed at will. A dairyman was recently asked to express his opinion of the new milk, and two glasses, one containing his own milk and the other the artificial fluid, were placed before him. He praised what he supposed was his cow's milk and expressed a very modified appreciation of the other. His surprise on learning of his error was naturally great.

INTRODUCTION OF BACTERIA.

The new milk has been built up from a basis of casein obtained from the soya bean. Casein, of course, is likewise the basal constituent of cow's milk. The beans are treated by a special process whereby all oil and waste matter are removed and only the pure casein left. To this basis are added in exact proportions fatty acids, sugars and salts and emulsification is carried out.

The difficulty of producing a perfect emulsion (milk is one of the most perfect emulsions known) has been completely overcome, the new fluid satisfying every test in this direction, even to the extent of refusing to "cream."

Milk, however, is something more than a food substance; it is a living fluid containing a definite strain of bacteria which assist in its digestion. In order that the synthetic milk may approximate in all respects to the real milk bacteria of the required strains, including the lactic acid (sour milk) bacilli rendered famous by Metchnikoff a few years ago, are introduced to the fluid and permitted to act upon it until it reaches exactly that state of what may be termed maturity at which fresh cow's milk is obtained. That it is indeed a real milk is proved by the fact that excellent cheese and "butter" can be made from it.

The advantages of the new milk are obvious. It is, of course, free from all suspicion of being contaminated with "milk-borne" diseases like tuberculosis, scarlet fever, or diphtheria. It can, moreover, be made up in any proportions desired, that is with more or less casein fat, sugar, or salts, and thus can be supplied to children and invalids according to a medical prescription. Finally, the new milk can be produced more cheaply than any ordinary milk, and should thus prove a real boon to the poor.

The distinctive taste of the milk is due to the use which is made of the soya bean. It is almost impossible to describe it, since like the taste of celery or cinnamon it is peculiar to itself and characteristic. A sample of the milk was submitted to a food expert

who has travelled extensively in the Far East, with the request that he would, if possible, name the ingredient imparting the flavor to it. Without hesitation, and with a smile at the pleasant memories recalled, he declared "soya," and added: "The history of that bean is like a romance."

USES OF THE SOYA BEANS.

That this statement is no exaggeration is proved by the fact that while the first consignment of soya beans was sent to Europe so recently as 1906 today Western requirements are something like a million tons a year. The beans are grown in China, Japan, Korea and Manchuria, where they have long been valued for their oil and for the waste products after the oil has been extracted, which are used as fertilizers in the rice and sugarcane fields. Vermicelli biscuits and other foodstuffs are also manufactured from the beans.

In this country the soya oil has now a very ready and extensive market. It is used instead of the cotton seed variety on account of cheapness. Soap manufacturers are also coming to depend upon it. The chief use, however, would seem to be as cattle cakes for winter feeding. That the article which has fed so many milch cows during the last few years should itself be used in the making of artificial milk is undoubtedly something of a coincidence.

Most of the soya beans entering this country pass through Hull, which, with its great oil and seed mills, is the natural center for such a commodity. This import trade is already a very extensive one, the freights on soya beans having mounted up to a figure somewhere in the neighborhood of \$5,000,000 per annum. In addition a considerable export trade has recently sprung up owing to the demand of continental dairy farmers for soya meal.—*Indian Agriculturist*.

PRICKLY PEAR FOR DAIRY COWS.

(*E. W. Morse, Dept. of Agriculture, Queensland.*)

The prickly pear is denounced as Australia's greatest pest in your issue of 2nd April, page 767. If the species found there is anything like the American prickly pear, perhaps the result of a test by the dairy division of the bureau of animal industry may be of interest.

Prickly pear is very palatable to dairy cows, and when fed in amounts varying from 60 to 100 lbs. a day makes the cow very thrifty and productive. Larger amounts are too laxative in effect. The pear is low in protein and high in mineral matter. It contains from 87 to 93 per cent of water, and hence is a capital sup-

plement for cotton seed and its products. Compared for milk-making with other southern roughages, 1 lb. of sorghum hay equals 10.1 lbs. of pear, 1 lb. of sorghum silage equals 3.3 lbs. of pear, and 1 lb. of cotton seed hulls equals 8.8 lbs. of pear. By substituting 60 to 75 lbs. of pear for a portion of dry roughage, the per cent of fat in the milk dropped .42 per cent on the average, but the milk flow increased.

Two dry cows were maintained for fifty and sixty days respectively on 113 and 105 lbs. of pear and 2 lbs. of cotton seed meal daily. One cow fed pear alone lost 30 lbs. in weight in seventy days. Another cow died from stoppage of the intestine by fibre balls from the pear when it was the sole ration. Pear-fed cows were more sensitive to the cold, and lost about 7.5 per cent in milk flow when fed a heavy pear ration, as compared to 1.91 per cent for cows on a dry ration. Cows fed pear drank less water, those receiving no roughage except pear going for days at a time without drinking. This shows pear to be a valuable feed when there is a scarcity of water.

One man can singe a ton of pear in fifty minutes with a gasoline torch, using 1 2-3 gallons of gasoline. The pear is singed on the stalk, and may then be pastured, which is wasteful, or cut and fed. The spineless pear is about the same in composition, may be harvested more cheaply, but yields less product. It costs about 6 dol. to 7 dol. per acre to establish a field. Shallow cultivation for weeds and grass is necessary. The second year's yield in Texas was 85 tons per acre, while the yield from old stumps runs above 100 tons per acre.—*Breeders' Gazette*.

TRIUMPH OF THE ITALIAN TOMATO.

The tomato was given to the world by America, but Italy is today teaching the rest of the world by example how it should be raised and how it should be preserved. Italian canned tomatoes have practically pushed the American product out of the English market, and have gained an enormous market in the United States. The Italians raise a solid meaty tomato of fine color and it is so packed in the cans that the consumer is not obliged to pay for a large percentage of water.

Canned tomatoes, however, are put up principally for the export trade. The Italians themselves prefer their tomatoes in the form of sauce or paste, which is nothing more nor less than boiled-down tomato pulp, minus the skins and seeds, as set forth in an interesting manner in a report by Commercial Agent J. Alexis Shriver, entitled "Canned-Tomato Industry in Italy," recently issued by the Bureau of Foreign and Domestic Commerce. This sauce is put up in cans and is used by the Italians in a great variety of dishes, of which spaghetti is, perhaps, the most familiar to Americans.

According to fairly accurate statistics the area planted in tomatoes in Italy is about 22,000 acres, producing about 385,000 tons. The exports to the United States amount to about 20,000,000 pounds of canned tomatoes and tomato sauce, and some 8,000,000 pounds of the product go to South America. The total value of the tomato exports from Italy is well over \$6,000,000.

The skins and seeds that were formerly wasted are now utilized, the former as stock feed and the latter as a source of oil. The crude oil is suitable for soap making and for lamps and the refined oil is said to be edible. Commercial Agent Shriver's report, "Special Agents Series No. 93," may be obtained from the Superintendent of Documents, Government Printing Office, Washington, at 5 cents a copy.

BRITISH COLUMBIA COW ESTABLISHES RECORD.

Consular Reports has published the following information from Consul General R. E. Mansfield, Vancouver, Canada:

A Holstein cow at the Colony Farm, Escondale, British Columbia, has broken all records in Canada for milk production, and established a new world's record for a period of 86 successive days, during which time she produced 9376 pounds of milk and 107 pounds of butter. The cow is a pure-bred Holstein, 4 years old. She produced 3415 pounds of milk and 98 pounds of butter in 30 days, and her record for 7 days is 833 pounds, and for 1 day 123 pounds of milk. The highest record cow on the Colony Farm, also a Holstein, produced in 350 days 27,888 pounds of milk. In the same herd there are 10 cows with 1-day records of 100 pounds of milk each.

The "Colony" is one of the prize dairy farms in the province, the herd being composed entirely of animals selected especially for their milk-producing qualities.

WHAT EVERY POULTRY-KEEPER SHOULD KNOW.

Don't allow male birds to run with the hens after the hatching season is over.

Eggs cannot be produced without nitrogenous food in some shape. Bones are absolutely essential.

Roosts so narrow that birds must be continually straining to keep their balance will cause them to lay soft-shelled eggs.

Charcoal is good for poultry, having a healthful influence over the whole system. They will eat much of it when placed within reach.

In selecting ducks for breeding, size of frame, length of body, and general activity should be looked for. Without size of body we cannot expect to obtain large ducklings.

Usually not enough attention is paid to the family history of fowls for breeding purposes, as regards their health. Constitutional weakness, though it be apparently overcome, should never be allowed to enter the breeding pen.—*Poultry*.

DUSTING PLACES FOR FOWLS.

Fowls young and old alike must dust! On the surface the runs are dry enough to provide the birds with dusting holes in odd corners out in the open. Few there are who do not enjoy "bathing" to the full these days. The smallest of our chicks are in the fashion as soon as the warm and dry weather sets in. They scratch holes in the earth and wallow in it to their heart's content. Indeed, so much do they indulge in dust baths in the sunshine that anyone not understanding the habits of fowls might imagine them to be sorely troubled with lice! And yet there never were cleaner birds.

It is the time of year for sunning and dusting, and fowls of all ages delight in it. In grass runs it may be difficult to allow the birds full scope in this direction. All is well if there is a hedge-row accessible, or some well-grown bushes. However, when such means are not to hand, one must contrive. A dusting box in a small shed is often more bother than it is worth, and better that the box be in the open in a sunny corner. A good dust hole can be made by removing a large turf and just loosening the earth with a garden fork. Make the space big enough for half-a-dozen fowls, and after loosening the earth shake into it the soil from the lifted turf. The birds will take to it as a duck to water; it is Nature's way of keeping them clean.—*Exchange*.

FEATHER PLUCKING.

Although I have an abundance of room for my fowls I am obliged to keep them within limits, because I raise eight varieties, and every year I have some cases of feather plucking. I have discovered a method of combating this vice, which has proved successful in every case. I make a paste of vaseline and powdered aloes and work it into the plumage of the birds which are being plucked, all around the plucked area. This paste is intensely bitter, and after a hen has plucked one feather which has been treated she is satisfied and gives it up. It is amusing to watch a feather-plucker when she gets a treated feather in her throat. She first gasps, then she wipes her beak in the straw or tries to scratch the bitter taste out of her mouth with her foot, and for several minutes comes as near making wry faces as a hen can. As my hens usually begin on the males I have no trouble about plucked hens, since I began using this mixture.

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A complete list of the publications of the Board available for distribution (together with the titles of certain issues now out of print) is to be found on the cover of the last biennial report.

Applications for publications should be addressed to the Mailing Clerk, P. O. Box 207, Honolulu, Hawaii.

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The United States Geological Survey topographic map of Kauai is also on sale, and copies will be mailed on receipt of 50 cents.

The records and maps of this division are available for inspection by any one who desires information relative to water resources, topography, etc. Blue print copies of hydrographic data relative to any stream, ditch, spring, etc., which may be under observation by this division will be mailed free of charge on request.

This division will also make ditch seepage losses and utilization investigations when the actual cost of the labor, materials, subsistence, transportation, etc., of such investigations is paid by those benefited.

G. K. LARRISON,
Superintendent of Hydrography.

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All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

DAVID HAUGHS,
Acting Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications **SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.**

EDW. M. EHRHORN,
Superintendent.

THE HAWAIIAN FORESTER AGRICULTURIST

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PEARL OYSTER POSSIBILITIES.

Oyster culture has been tried in comparatively recent times at Pearl Harbor, Oahu, but with small success and nothing has been heard of any revival of the experiment for some years, although the harbor named has upon its shores remains of ancient oyster beds of great extent. A late number of the Agricultural News discusses a suggestion in another periodical that there is considerable possibility of the founding of a pearl oyster industry in the British West Indies. It mentions the fact that an old bed still exists on the windward coast of Barbados, and says that, "although attempts in the past to establish an industry in this island have not been successful, it has probably been due to want of knowledge, for it is understood that a very thriving industry exists at the Danish island of St. Thomas."

Thus it would appear that the conditions for such a thing are about even as between Oahu and Barbados. Mr. Prest, a well-known Canadian authority, is quoted as saying, in the Canada-West India Magazine:

"The conditions prevailing in most of the islands are sufficiently similar to those obtaining in Ceylon to justify the importation of the Ceylon pearl oyster which is one of the most highly productive kind. An abundance of microscopic food is required by the animal and also an absence of competing organisms. The sea bottom should have an uneven, mixed, rocky and sandy surface interspersed with broken coral and weeds, to prevent over-crowding and the drifting of sand. There must also be in existence a gentle current for the conveyance of fresh food, and the temperature must be equable and warm."

In conclusion the Agricultural News says:

"As regards the return to be expected, it is stated that in Ceylon \$100 worth of pearls per 1000 shells is regarded as a profitable industry. The Bahrein fisheries yield over two million dollars of pearls annually, employing over 800 boats. In Ceylon the fisheries are even more valuable, and it is evident that the establishment of this industry in the West Indies would enor-

mously strengthen the finances of the colonies, provide labor for those who are not required on the estates, and be a source for obtaining revenue from natural sources not connected with the soil."

PAPER FROM SUGAR-CANE TRASH.

This magazine has always taken note of any information regarding paper-making material from tropical growths. The following statement of the value of sugar-cane bagasse for that purpose is credited by the International Sugar Journal to William Raitt:

"One hundred tons of cane give 25 tons of bagasse or 11.1 tons of coarse unbleached paper, which costs \$45 per ton to make, and sells for \$64.20, leaving \$19.20 per ton profit, or \$213 per 100 tons of cane. Deducting the cost of oil to substitute for bagasse, say \$20, there remains \$193 profit at the factory.

"On other hand, we are severely handicapped by remoteness from the world's industrial centers and we have no opportunity to find a local market. Suppose it costs, however, over all, \$15 a ton to cover marketing expenses, or \$170 per 11.1 tons of coarse unbleached paper, there still remains a profit of \$23 per 100 tons of cane."

In this number will be found a selected article on dry farming, which, reading like a romance, will no doubt be eagerly perused by homesteaders.

In the March number an interesting article appeared, dilating upon the food value of the banana—or "golden fingers," as the fruit was called in the heading. Following up a topic discussed in a previous article—which was reprinted in the *Forester—Tropical Life* (London) for February magnifies the sweet potato as well as the banana for its foodstuff possibilities while the "staff of life," or wheaten bread, is "broken in the land" by the hammer of war. The entire article is reproduced on another page and will repay study.

An article in this number from *Tropical Life*, on "Exploiting Eucalyptus Trees," will have much local interest, from the fact that eucalypts have been the subject of considerable attention in the reforestation operations of our division of forestry.

By the February report of the division of animal industry it will be seen that the extension of the campaign against bovine tuberculosis to the islands other than Oahu has made substantial progress.

Hog cholera control in the Territory would appear to be as nearly effective as possible, according to the report of the veterinarian for February.

The periodical outbreaks of cerebro spinal meningitis among equine stock seem to constitute the most formidable problem of the animal industry division at present.

Dr. Norgaard, in his report for February, again effectively replies to cavilling at the quarantine of dogs against rabies.

There is scarcely a month these times which does not show additions to imported thoroughbred stock of various kinds including fowl. Evidently animal industry in the islands is constantly looking up.

Both in the prevention of insect pest invasion and the introduction and propagation of useful insects the division of entomology from month to month maintains its good record.

In the present Legislature the homesteader does not want champions, but it is too early at this writing to say what will be the results of their efforts.

Nearly 15,000 plants distributed in February is the good record made by the division of forestry.

The bill mentioned by the superintendent of hydrography, in his February report, for the appointment of a commission to investigate the water resources of the Territory, has become law.

CASSAVA FOR PIGS.

In Queensland cassava is used as food for pigs with success, and is found to be a good substitute for the potato. The pig eats the cassava either raw or cooked, and digests it equally well in both cases, and uses all the hydrocarbonic matter, amounting to about 80 or 90 per cent of the total quantity consumed. All that is needed is to soak the tubers for some hours in cold water, to obtain a food ready for immediate consumption, a food, the nutritive value of which is equal to barley or rice meal. At the same time, cassava must not be considered as a complete ration, as it is necessary to supplement it for young animals, at least, with food containing the phosphates and nitrates wanting in cassava. For this purpose oil cake and ground green bones are used, or, better still, degelatinized bones powdered.—Agricultural News.

DIVISION OF ANIMAL INDUSTRY.

HOG CHOLERA.

Honolulu, March 12, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I have to report that hog cholera has made its appearance on Maui, Dr. Fitzgerald, under date of Feb. 25, reporting two small outbreaks, one on the Haleakala ranch and the other on the Maui Agricultural Co.'s ranch. The infected premises were immediately placed under quarantine and sufficient hog cholera vaccine secured for the treatment and prevention inoculation of all affected and exposed hogs. The origin of the outbreak remains obscure, no hogs having been introduced from any of the other islands for several months past, nor has there been any transfer of animals between the two places, which are more than seven miles apart. I am therefore inclined to believe that the outbreak is due to a recrudescence of infection already on the premises, which theory is supported by the extremely mild form in which the disease has made its appearance.

With the timely application of serum there is consequently little danger of serious losses, even though it is doubtful whether the established quarantine will prove effective.

From Hawaii and Kauai no new outbreaks have been reported, one report investigated by Dr. Elliot proving not to be hog cholera.

On Oahu the disease now seems to be well under control, the fact that no definite case of hog cholera has appeared among the several hundred imported hogs that are being swill-fed near Scheffield Barracks being almost a guaranty that the disease has either died out or become so attenuated that the animals are able to resist it.

A few cases of pneumonia have occurred, some among suckling pigs, and while the post mortem lesions in some of these bear a close resemblance to those seen in swine plague, they are, if of specific origin at all, most likely due to other bacteria such as the pneumo-coccus for instance. In any case every precaution possible has been taken to deal with an outbreak, should it make its appearance, and in the meantime hog raising is steadily increasing and rapidly becoming one of the most important branches of the live stock industry.

BOVINE TUBERCULOSIS CONTROL WORK.

Very little testing has been done here during the past month, the semi-annual general test being planned for the middle of March. From Hawaii Dr. Elliot reports the testing of 17 small herds with a total of 90 cattle, among which two reactors were

found. These figures include a quarterly retest of three dairies which contained no less than 35 reactors when previously tested, while on this occasion only one was found. This certainly looks promising for the early suppression of the disease in the Hilo district, after which it is to be hoped that some arrangement can be made that will allow Dr. Elliot to extend the work to the entire island.

Both Drs. Fitzgerald and Glaisyer report the testing of various herds and while perhaps in a less systematic way than Dr. Elliot, still every reactor located and branded is one center of infection less to deal with when system has been established.

The annual report (1914) of the U. S. Bureau of Animal Industry has been received and shows that the work of eradicating bovine tuberculosis in the District of Columbia has reached almost exactly the same stage as our own work, that is, their last complete test gave 2.03 per cent of reactors, while ours gave 2.08 per cent. But while the District of Columbia herds aggregated only 1628 animals (33 reactors), we dealt with nearly 7250 head (151 reactors), and while the District of Columbia paid respectively 50, 75 and 100 per cent indemnity for badly diseased, slightly diseased and doubtfully diseased animals, we paid none. The work was begun in both places almost at the same time (1910), and similar to our extending it to the other islands so is the bureau gradually taking in the surrounding parts of Virginia and Maryland in gradually widening circles, they having last year tested 5779 cattle in Virginia (3.49 per cent reactors) and 1155 head in Maryland (3.64 per cent reactors).

CEREBRO SPINAL MENINGITIS OR FORAGE POISONING.

A rather severe outbreak of this disease has occurred in one of the plantation stables on this island, nine valuable animals (7 mules and 2 horses) dying in the course of a few days. In this connection the same federal report states that, though a number of large outbreaks have occurred in seven different States and the disease has been under constant observation and investigation, nothing more is known today about its nature, cause, treatment or prevention than was known years ago, and that is nil. There is no other disease before which the live stock sanitarian of today stands so absolutely helpless; there is nothing he can suggest beyond the most elementary precautions such as change of feed, pure water and general cleaning up and disinfecting of the premises. Even the expert of the Rockefeller Institute, the very man who solved the mystery of infantile paralysis, has failed to get one step nearer to the etiology of this fatal disease, which, so far as this Territory is concerned, remains the only serious menace to horse stock since glanders was eradicated. Every effort even to produce the disease, to transmit it from one animal to another,

has failed, and long continued feeding experiments with polished rice or with hominy (corn with the outer shell removed) caused no inconvenience or symptoms of nervous derangement, and the total absence of a specific micro organism, even an ultra microscopic one, makes it of course impossible to attempt the now so universally used serum therapy.

Since the above was written it has become necessary to destroy three additional mules similarly affected, making the total loss in one week 10 mules and 2 horses.

RABIES.

This disease continues unabated in the Pacific Coast States, various epidemics having been reported from such localities, especially where single cases were reported from three to six months ago. When, therefore, this board's quarantine regulation pertaining to rabies has again come in for criticism by Coast tourists through the columns of the local press, it may not be amiss to state that the reappearance of the disease in one of the above-mentioned localities in California has, so to speak, "struck home," a lovely little girl related to a Honolulu family having recently died after being bitten in the face by a mad dog. The child saw through a screen door a strange dog on the porch and opened the door to pet it, when the animal flew at her and lacerated her face. Almost immediately afterward the dog died and an examination by the Berkeley experts pronounced it affected with rabies. The child was immediately sent to the Pasteur Institute for treatment but, the wounds being so close to the brain, she succumbed on the twenty-first day—the last day of the treatment. As no time was lost in getting the patient under treatment—in fact less than twenty-four hours—it can easily be understood what the result might be if the disease should gain an entrance here where at least seven days would elapse before a bitten person could be either sent to the nearest Pasteur institute, in San Francisco, or the material for preventive inoculation could be cabled for and reach the patient here. This case is however an unusual one, the time of incubation as a rule being a great deal longer than 21 days, the appearance of the disease in the bitten person depending to a great extent upon the distance of the wound from the brain. The virus must first find its way into the central nerve canals at the place of injury and from there slowly work its way to the brain. Consequently the further from the brain the wound is inflicted the longer it takes for the poison to reach the brain and, as fortunately 75 per cent of all bitten wounds occur on the hands and legs, there is generally sufficient time to get the patient under treatment and to get the treatment, which requires 21 days, completed before the disease sets in. With the appearance of the first symptom, however, the patient is doomed, nothing remaining to

be done but to attempt to ease the agony of the victim, which however is a very difficult matter, the nervous suffering being so intense that the ordinary remedies, morphine for instance, are almost without effect and chloroform narcosis must be continued until death.

It therefore becomes manifest that every precaution must be taken to exclude the disease from this Territory and were it left to the writer the quarantine period would be extended to six months instead of, as at present, four. The only countries known to be free from rabies are England, Australia and New Zealand, in all of which a six months' quarantine is rigidly enforced. The impression voiced in the newspaper article above referred to, in which the said tourist held that the dog in question could have been shipped to Australia first and then returned to Hawaii, thereby avoiding the quarantine (dogs from Australia being admitted to the Territory without quarantine), is therefore based on a misapprehension. The dog could not have been landed in Australia without going into quarantine for six months, nor could it have been transhipped at an Australian port and receive the certificate required for entry here which must certify to the length of time a dog has been in Australia.

On the other hand, it is not desired to place any unnecessary obstacles in the way of bringing dogs into the Territory, in which connection I wish to state that all the dogs on board the interned German vessels now docked in the harbor of Honolulu, and which have been quarantined on board their respective ships, were released from quarantine last week, all the ships having been here more than four months, and all the dogs accessible to examination being found apparently healthy. The same privilege will be granted dogs on board interned vessels anchored outside the harbor when application for release is made and the dogs presented for examination.

QUARANTINE STATION.

With regard to the small dog hospital to be built at the Honolulu station and for which an appropriation was made at the last meeting of the board, I regret to say that the keeper of the station, Mr. Steward, has been dangerously ill for the past two weeks and was recently taken to the Queen's Hospital for a major operation. He is, however, now on the way to recovery and the work will begin as soon as he is able to resume his duties.

Very respectfully,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, February 28, 1915.

Dr. Victor A. Norgaard, Chief of Division of Animal Industry.

Sir:—I have the honor to submit the following report for the month of February, 1915:

TUBERCULOSIS CONTROL.

The following were submitted to the tuberculin test:

	T.	P.	C.
Waialae Dairy	4	4	0
St. Clair Sayers.....	1	1	0

POST MORTEM EXAMINATIONS.

Two cows condemned in the early part of 1914 were examined at one of the local slaughter houses, the results being as follows:

No. 1. Grade Durham cow imported from the State of Washington. Reactions large. Lesions: A few wall encapsulated nodules in the lungs.

No. 2. Jersey. Reaction small. Lesions: Retro-pharyngeal glands enormously enlarged and an entire mass of tuberculous tissue; lungs and mediastinal glands filled with nodules; supra-renal glands enlarged and filled with nodules and the udder simply a mass of tubercles.

LIVE STOCK IMPORTATIONS.

Matsonia, San Francisco: 7 crates poultry, Chang Bros.; 4 crates poultry, Ching Wan; 3 crates poultry, W F X Co.

Virginian, Seattle: 1 crate barred Plymouth Rocks, C T Company.

Sierra, San Francisco: 3 crates poultry, 3 rabbits, W F X Co.; 1 crate chickens, P. H. Boggs.

Lurline, San Francisco: 4 crates poultry, Barrere Sales Co.; 8 crates poultry, Chang Bros.; 4 crates poultry, Ching Wan; 11 crates poultry, Club Stables; 5 crates poultry, C. H. Lewis; 4 crates poultry, Chang Bros.; 6 crates poultry, Sing Song Company; 55 mules, 2 horses, Schuman Carriage Company; 1 crate white rats, U. S. Lep. Exp. Station.

Wilhelmina, San Francisco: 7 crates poultry, Barrere Sales Co.; 1 crate Guinea hens, J. F. Colburn; 1 English bulldog, James B. Laing.

Dix, Seattle: 28 horses, Q. M. Dept.

Manoa, San Francisco: 1 Holstein Bull, D. P. R. Isenberg; 10 crates poultry, J. F. Reed; 9 crates poultry, Barrere Sales Co.; 9

crates poultry, W. F. Pogue, Maui; 2 rabbits, 1 crate poultry, 1 crate pheasants, 1 crate pea fowls, 1 crate Chinese geese, W F X Company.

Respectfully submitted,

L. N. CASE,
Assistant Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

Honolulu, February 28, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the work performed by the Division of Entomology for the month of February, 1915, as follows:

During the month 47 vessels arrived at the port of Honolulu of which 25 carried vegetable matter and two vessels moulding sand. Seven of these vessels came via the Panama Canal.

<i>Disposal.</i>	<i>Lots.</i>	<i>Parcels.</i>
Passed as free from pests.....	599	19,544
Fumigated	2	25
Burned	31	31
Returned	4	4
Total inspected.....	636	19,604

Of these shipments 19,382 packages arrived as freight, 163 packages through the postoffice and 59 packages as baggage of passengers and immigrants.

RICE AND BEAN SHIPMENTS.

During the month 23,341 bags of Japanese rice, 27 sacks of Chinese rice and 1974 bags of Japanese beans arrived from oriental ports, which after thorough inspection were found free from pests and were passed for delivery.

PESTS INTERCEPTED.

Twenty-three packages of fruit and 5 packages of vegetables were taken from the baggage of passengers and immigrants from foreign countries; all were destroyed by burning. In one package of flowering bulbs we found many bulbs infested with the bulb aphid (*Pemphigus species*), and fumigated the package before delivery. A lot of onions and garlic taken from a Filipino was found infested with the larvae of a *Lepidopteron*; this illustrates

how easy it would be to introduce such pests. All such foodstuffs are confiscated from these immigrants whether clean or infested, but we make a careful study of the materials before burning same. A shipment of coconuts from Fanning Island was fumigated before delivery on account of being infested with scale insects (*Nemichionaspis minor*). A cacao pod containing seeds and consigned to the Hawaii experiment station arrived in a decayed condition. The seeds were carefully removed and the decayed pod was burned; no indications of insect infestation were found. Two packages of tree seeds, one package of bulbs and one package of plants arriving from foreign countries were returned by the postmaster as unavailable under the ruling of the Federal horticultural board.

BENEFICIAL INSECTS.

Mr. D. T. Fullaway has continued with the breeding of the various parasites for the fruitfly and hornfly. During the month many parasites have been distributed in various sections as shown by his report attached hereto.

Owing to a slight outbreak of the cottony cushion scale we were able to rear and distribute two strong colonies of the Australian ladybug (*Vedalia cardinalis*).

HILO INSPECTION.

Brother M. Newell reports the arrival of eleven steamers five of which brought vegetable matter consisting of 150 lots and 2936 parcels. Out of this lot 25 sacks of potatoes had to be overhauled for scab and dirt, and seven sacks out of the lot were destroyed as not being free from disease. During the month the T. K. K. steamer Kiyu Maru arrived direct from Japan bringing 9180 sacks of rice, 449 bags of beans and 60 bags of peanuts, all of which were found free from weevils and other pests.

INTER-ISLAND INSPECTION.

During the month of February 62 steamers plying between Honolulu and the ports of the other islands were attended to and the following shipments were inspected and passed:

Plants, 110 packages; taro, 720 bags; fruits, 11 packages; vegetables, 62 packages; total, 903 packages.

The following packages were refused shipment on account of infestation or of having undesirable soil attached to the plants: Plants, 28 packages; fruit, 19 packages; total, 47 packages.

Respectfully submitted,

E. M. EHRLHORN,
Superintendent of Entomology.

REPORT OF INSECTARY.

Honolulu, February 28, 1915.

E. M. Ehrhorn, Superintendent of Entomology.

Sir:—I submit herewith my report on the operations of the insectary during the month of February, 1915:

PROPAGATION.

Diachasma fullawayi—794 females and 1588 males.

Diachasma tryoni—44 females and 88 males.

Tetrastichus giffardi—8200.

LIBERATION.

Diachasma fullawayi—681 females and accompanying males.

Tetrastichus giffardi—7600.

Of the *Tetrastichus* 6500 were liberated in upper Nuuanu valley (Spencer's and McLean's) and 1100 under an elengi tree close to the insectary. Of the *Diachasma* 591 were liberated in Nuuanu valley mostly at Spencer's, and 90 under an elengi tree close to the insectary.

The number of pupae handled during the period corresponding to the above emergence was 21,908 for *Diachasma fullawayi* and 3151 for *Tetrastichus giffardi*. The percentage of parasitism estimated on these figures is 10% for the former and 17% for the latter.

Respectfully submitted,

D. T. FULLAWAY.

 DIVISION OF FORESTRY.

Honolulu, March 11, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report for the Division of Forestry for the month of February, 1915:

FOREST FIRE ON KAUAI.

Besides two matters, which have already been made the subject of special reports, nothing of particular importance has come up in the Division of Forestry with the exception of a forest fire on the island of Kauai. This started from a grass fire set in dry weather by a homesteader, Joe Rodrigues Aguiar, on his homestead lot No. 44, Series 1, Kapahi, on February 6. A strong wind fanned the fire, which soon began to spread, and, although he

made every effort to extinguish it by back firing and constructing firebreaks, the fire spread through the grass into the Kealia forest reserve and burned over an area of approximately 275 acres on both sides of the ridge that starts at the Akulikuli springs and was stopped where this ridge joins the main mountain range at Kapahi. About 150 acres of native forest was burned over.

District Fire Warden G. P. Wilcox employed 76 men to fight this fire on February 6, 7 and 8, and on the last day finally extinguished it at a total cost of \$84.50. Aguiar worked all three days on the fire and has not been paid for his services.

I have considered the advisability of prosecuting Aguiar for the responsibility of starting this fire, but since he did not allow "said fire to escape from his control *without using every effort to extinguish it,*" as shown above, he is apparently relieved under the law from prosecution. However, I have cautioned him by a strong letter to be more careful with the use of fire in the future and that otherwise it may go hard with him next time. I have also asked the district fire warden to watch out for him.

As during January, a large share of my time has been used in February in getting out the inventory of property in the possession of the board and in editing and publishing the board's biennial report.

The appended report of the forest nurseryman shows the activities in his department during the month.

Respectfully submitted,

C. S. JUDD,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, March 11, 1915.

C. S. Judd, Esq., Superintendent of Forestry.

Dear Sir:—The following report gives the principal work done during the month of February, 1915:

NURSERY.

Distribution of Plants.

	In seed boxes.	In boxes trans- planted.	Pot Grown.	Total.
Sold	3000	....	60	3060
Gratis	6600	150	197	6947
	<hr/> 9600	<hr/> 150	<hr/> 257	<hr/> 10,007

COLLECTIONS.

Collections on account of plants sold amounted to \$4.60.

PLANTATION COMPANIES AND OTHER CORPORATIONS.

The number of trees distributed under this heading amounted to 4850 (600 in seed boxes, 3100 in transplant boxes and 1150 pot grown).

MAKIKI STATION.

The two men employed at this station have been doing the regular routine work, which consists of mixing and sterilizing soil, transplanting and potting trees, etc.

HONOLULU WATERSHED PLANTING.

During the month 434 koa and 1887 kukui trees were planted, making a total of 2321. The total number of trees planted on and around Sugar Loaf to date amounts to 10,486 (koa, 6850; kukui, 3636). We are having favorable weather for this work and all the trees planted so far are doing exceedingly well.

ADVICE AND ASSISTANCE.

The following gives the number of visits made and advice given to people applying for same: Visits to places in and around city, 8; requests for advice by telephone, 12; requests for advice by people calling at nursery, 10; requests for advice by letter to people on the other islands, 7.

Respectfully submitted,

DAVID HAUGHS,
Forest Nurseryman.

It is stated in The Board of Trade Journal for August 20, 1914, that a thirty years' concession has been granted for the exploitation of coconut groves in the zone of the Pacific coast of Costa Rica to a company known as Compania de Cacaes del Pacifico. The company undertakes to preserve and replant the existing coconut palms and to plant coconuts in those places where they do not already grow. The company is also to establish within a year a transport service consisting of sailing vessels of at least 15 tons register, fitted with auxiliary petrol motors of 20 h.p. The company as well undertakes to establish a factory in San Jose for the extraction of coconut oil.

DIVISION OF HYDROGRAPHY.

Honolulu, March 12, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the Division of Hydrography during February, 1915, is submitted:

WEATHER CONDITIONS.

Except for the period February 20 to 24, the rainfall for the month was far below normal, and streams are again nearing minimum flow. The water in Wahiawa and the upper Nuuanu reservoirs has reached a very low stage.

UTILIZATION INVESTIGATIONS.

An investigation of ditch losses on the Waialua Agricultural Co. plantation was completed, and measurements were made to check the Venturi meter and weir maintained below Wahiawa reservoir. The loss by seepage in one of the ditches of Kahuku plantation was also checked. Copies of these reports are appended hereto.

PUNALUU WATER.

Additional investigations made in the Punaluu valley on Oahu lead to the conclusion that a minimum of about eight million gallons per day, and an average of about ten million gallons per day, of excellent water may be obtained at the 800-foot level in that valley, and may be diverted without interfering with existing diversions in the lower valley. Attached hereto are copies of letters to the Governor and H. K. L. Castle relative to the utilization of this water.

A new stream measurement station was installed in coöperation with the Waiahole Water Co. on the Waiahole stream at a point about one thousand feet below their power plant, which will keep a continuous record of the amount of water developed in the north end of the Waiahole tunnel. The water company paid all costs of this station except for the services of the engineer in charge, who is paid from Federal funds. The outflow from this end of the tunnel has dropped from 32 million gallons per day on January 22 to 30 million gallons per day on March 4.

LEGISLATION.

Several conferences have been held with other territorial officials relative to the investigation and conservation of Hawaii's

water supply. As a result it is probable that a bill will be introduced in the near future in the House of Representatives to provide for the appointment of a commission to investigate the water supply and the existing laws pertaining thereto to the 1917 Legislature of the Territory of Hawaii.

CHANGES OF PERSONNEL.

On February 5, Mr. J. C. Dort, assistant engineer, who has been in charge of the island of Kauai, was directed to report at San Francisco for further orders. Mr. Dort has served a two and one-half year assignment to this Territory, and, according to the agreement made with him when he reported here for duty, is now entitled to an assignment on the mainland. Mr. Dort is a civil service employee of the U. S. Geological Survey. He will be replaced by Mr. W. V. Hardy, assistant engineer, who was formerly in charge of Kauai and who will report for duty about March 15. In the meanwhile Mr. D. E. Horner, who has acted as assistant to both Mr. Hardy and Mr. Dort, will be in charge of the work on Kauai.

Mr. Howard Kimble, assistant engineer, who has been in charge of special utilization work, including seepage investigations, has tendered his resignation effective March 31.

OPERATION AND MAINTENANCE.

The usual operation and maintenance work on Oahu, Kauai and Maui was carried on during the month. A considerable amount of minor repair work has been done, and all equipment and structures are in excellent condition.

MARCH PLANS.

In addition to routine and maintenance the following special work will be handled:

KAUAI.

The construction of the stream gaging station being built in coöperation with the Hawaiian Sugar Co. on the Olokele river will be started on March 10, and work on the two stream gaging stations on the Kapaa river above the Kapaa homesteads will be started during the latter part of the month.

OAHU.

A small amount of ditch loss investigation work will be done on the Kahuku plantation, and a number of weirs and ditches of

the Heeia Agricultural Co. in the Heeia and Kaneohe valleys will be checked by measurements. Additional measurements and investigations will be made relative to the Punaluu water utilization project. Further information and data will be gathered in relation to Honolulu's future water supply.

MAUI.

Seepage losses from the ditches of the Maui Agricultural Co., the Hawaiian Commercial & Sugar Co. and the Pioneer Mill Co. will be investigated.

Very respectfully,

L. K. LARRISON,
Superintendent of Hydrography.

LIST OF GAGING STATIONS MAINTAINED BY THE DIVISION OF HYDROGRAPHY ON FEBRUARY 28, 1915.

Island.	Maintain- ed on Jan. 31.	Discon- tinued in February.	Establish- ed in February.	Maint. on Feb. 28.	Measurements. Regu- lar.	Miscel- laneous.
Kauai	33	a*	a*	33a*	3	0
Oahu	46	0	1	47	5	8
Maui	42	0	0	42	6	1
Total.	121	0	1	122	14	9

Note.—In addition to above, Mr. Kimble made about 10 seepage measurements during the month.

a*—Kauai report not yet in to date.

WAR, WHEAT, AND TROPICAL FOODSTUFFS.

Referring to our leader last August on the above subject, wherein we discuss how the tropics can supply us with foodstuffs to replace wheat and cereals to some degree, and relate how one wheat-consuming center which had increased its demands by 22 per cent during the same period that its supplies have increased only $4\frac{1}{2}$ per cent, since that article was written we have noted, especially of late, repeated references in the international press, and especially the English papers, to the tendency of the price of wheat, and therefore of bread, to further advance, a fact that is not failing to strike home to all thinking men and women. Among the journals whose notes strike us as being particularly useful just now is the Colonial Journal for January. Firstly, in the way it has reviewed the government's arrangements to keep our tropical colonies and dependencies going, and especially where

it very truthfully adds: "It is very important to Great Britain to keep the tropical industries going, and great efforts have been made to support markets and prevent the discouragement of native growers." Further on our contemporary, speaking of the utilization of the potato in Germany and its enormous economic value during the war, says: "Vast quantities of this product are used for making spirit, and the industrial position of the country largely rests on this abundant and cheap supply. Some forty-five million tons of potatoes are grown annually, and a considerable portion of this is dried in factories and used as a food for both men and cattle. This dried stock is now forming a very important food reserve, and is being largely used in the making of bread." Compared to this, England and her Dominions overseas no doubt are safe for their wheat supplies, for "it is estimated that this spring 13,000,000 acres will be sown with wheat in Canada alone," a quantity which at twenty bushels per acre would suffice to feed the whole population of Great Britain, especially as, besides this, has to be added the production *chez nous*.* In the tropics, however, things are not as they should be. Many centers, both under the British flag as well as those belonging to other countries, as we have already pointed out, are not producing sufficient foodstuffs to feed themselves. "A nation that cannot free itself is not worthy to be free," and in like manner a people that has not the foresight and energy to grow its own foodstuffs is not worth troubling about, like "the ass that was left to starve because it was too obstinate to carry its own fodder." Many of the natives do not deserve any pity; unfortunately, we must put up with their easy-going life when times are prosperous and feed them at times like these; but this animal indifference to the future diverts any antipathy we might have to the suggestion that thriftless natives should be taxed in normal times as they will never be induced to grow more than their immediate requirements demand, and so the authorities must act for them, and lay up for a rainy day to provide them with the food that they neglect to grow for themselves, or having grown it, eat up greedily so long as it lasts. The Americans complain of the Philippines for this reason, but our own island of Trinidad, British West Indies, has always been a bad offender in the same way, as we pointed out in our October issue, when we discussed "Tropical Gardening" and expressed the hope that the book of Mr. Macmillan (of Ceylon) on the subject would be widely read and acted upon.

* It may be of interest to note that Germany is said to produce 28 bushels of wheat per acre, against 20 bushels in France, and only 15 in the United States. Our American cousins, to whom we owe these figures, produce, it seems, 80 bushels of potatoes only to the acre, against 190 in France, 226 in Germany, and 286 in Belgium. Efforts are being made to increase the American output.

Going back, however, to Germany and her potatoes, our own people overseas could do the same, but instead of the potato they can use the banana. In his book on this fruit, Mr. Fawcett discusses the question of making banana flour from the fruit, and also spirit from the rejected fruit and from the stems, and now the Colonial Journal also takes up the question of banana flour. "We hear of potatoes being used in Germany," they tell us, "in the production of bread, and they are not a bad addition to wheat flour, which is generally treated in such a way as to become rather indigestible, but a much better addition would be banana flour. This is cheaper than wheat flour at any time, and under present circumstances may be much more so, and as a foodstuff it is excellent. When dried and ground, a bunch weighing 65 lb. yields 8 lb. flour. Prepared bananas, known as 'banana figs,' a great favorite in Germany, are very good for children, and serve both as a sweetmeat and food. To utilize surplus or waste bananas needs, however, coöperation between the growers, for they can only be worked up to pay when the huge quantities available are all pressed into the service, and to do that all must help. Outside our London contemporary, the Philippine Agriculturist and Forester, being the organ of the College of Agriculture, Los Banos, P. I., very appropriately ran its No. 6 issue for last year as a Sweet Potato Number, and gives us thirty pages, without illustrations, crammed full of information on the subject. This shows how these "camotes," as they are called in this case, are free yielders and a staple food for man and beast, as well as raw material for starch and spirit factories. They are specially recommended for use as starch, according to the practical tests reported, whilst there are important factories for making alcohol from sweet potatoes in the Azores. Then we come to taniais, known also as yautias, or, in the United States, as "dasheens," supposed to be a corruption of "de la Chine" or "da Chine," which seem making a great stir in America. It was these that the friend, Mr. Swamp, of Florida (whom we mentioned as calling on us when we wrote the leader last August), claimed can be turned into many kinds of nourishing foods. They are the subject of two bulletins issued by our American cousins, that tend to show that you can have the equivalent of flour, potatoes, asparagus, and spinach from them, whilst whole they can be baked, stuffed, scalloped, boiled, mashed, candied, or turned into soup, pies, and puddings. With such a selection to choose from this one tuber, without troubling about many others, what man or nation worthy of the name can sit up and starve in the British tropics—or out of them—so long as our ships plow the main?—Tropical Life.

EXPLOITING EUCALYPTUS TREES.

According to the Indian Trade Journal, interest is being shown in the commercial possibilities of the Australian gum tree, *i. e.*, the eucalyptus tribe. The resultant oil is popularly known as mineral oil, which is, of course, a misnomer, but it owes this name to its use in the flotation process of obtaining sulphides from tailings. This oil, which is chemically a phellandrene one, yields in one case as much as 86 to 90 per cent concentrates, and whilst the Australian Pure Food Act prevents the oil being used for medicinal purposes, its use in mining has gone ahead rapidly, as the trees are great yielders. One New South Wales manufacturer, we are told, is making arrangements to supply 100 tons of phellandrene oil for the American and South African mining centers. One species of eucalyptus yields geraniol, the active principle of attar of roses, to obtain which plantations have been established, the leaves distilled, and the oil placed on the market. Then there is turpentine, both the French and American kinds, French from *E. dextropinca*, and American from *E. laevopinca*. The Australian trees, it is claimed, yield leaves that give oil at the end of five years, whilst it takes sixty years for the trees to reach that stage in America and Europe; and in the States, if not in Europe, the trees are being cut out rapidly. Finally we are told: "The product of the two Australian trees could be utilized in the manufacture of synthetical camphor, for which turpentine is required. From the leaves of a Queensland eucalyptus is obtained citral, from which iodine can be made; from this again artificial perfume of violets is manufactured. Citronellal is obtained from lemon-scented gum trees. It is a valuable product, in great demand in London. This by no means exhausts the constituents discovered in eucalyptus oils. Their utilization and potentialities in many avenues of industry remain to be determined."

Readers of our book on "Soil and Plant Sanitation" will remember that in the chapter on "Protective Belts" we strongly recommend the planting of eucalyptus trees, either to re-forest exposed areas, or as belts to break up large areas under one crop, with the view of restricting disease or pests should they attack the trees, and quote Jamaican, Hawaiian, Nyasa, Italian, and other authorities to show the advantages that have accrued when this has been done. The trees, as we then pointed out, are said not to do well in the plains, but elsewhere where they do flourish, besides helping, as above stated, as belts and shade trees, they evidently yield valuable products, as Mr. Baker points out, and also give lumber or firewood when done with. These and the further information *re* the oil, turpentine, etc., that the curator of the Sydney Technological Museum now calls attention to, should certainly stimulate the planting of eucalyptus trees where they will flourish; there is, however, one important point to look

out for, viz., make up your mind first why you are planting the trees, and then see that you plant the variety most suited to yield what you want. There are many kinds, each has its likes and dislikes as to soil, altitude, etc., and you must study these; also some will give just what you want, whilst others seem to give nothing at all.—Tropical Life.

DRY-FARMING.

By Dr. William MacDonald, of the Union Department of Agriculture.

The last romance of agriculture, the most daring of its many triumphs, is the Conquest of the Desert. Pictured in the winsome song of the Psalmist, the sonorous prose of the Hebrew prophet, and visioned in the pages of a modern seer, it has remained for the latest science, the deep-set share, and the diligent harrow to complete the ancient prophecy and to produce a harvest of corn from a rainless land.

To understand what has been accomplished, it will be necessary to sketch the rise and progress of this new branch of agricultural science known as dry-farming. In the study of dry-farming we are led at the outset to ask what is the real meaning of the term "Desert." The dictionary defines it as a "barren tract incapable of supporting population as the vast sand plains of Asia and Africa which are destitute of moisture and vegetation." Such a definition is apt to mislead us, for what is now a desert region may be transformed in a few years into a country of fertile fields capable of sustaining a large population. The most striking illustration of this fact is to be found in America. Spread out an old map of the United States of less than fifty years ago, and you will see that vast region marked "The Great American Desert" stretching from the Missouri to the Rockies. What has happened? In the space of a single generation, an army of settlers has invaded this country, and six trans-continental railroads bring the comforts of civilization to the farmer's door. Next, turning to the British Empire, we note that desert region of Australia so quaintly called the "Never-Never-Country," on the fringe of which farmers even now are settling. And, coming to South Africa, we mark out the Kalahari Desert or as it is termed in the native tongue the "Great Thirst Land." Even there the white flag of the surveyor can be seen staking out a fifty-thousand-acre farm from the silt-laden waters of the Orange River to the restless crest of a barren, blood-red sand dune. The lesson of all this is plain. In our dry and desert lands we possess a priceless heritage; and if there are any who still think that there are no more good farms to be had in our oversea Dominions you may remind them of that saying of Emerson: "The last lands are the best lands."

It needs science and great numbers to cultivate the best lands and in the best manner."

WHAT IS DRY-FARMING.

At a recent lecture on "South Africa," delivered by the writer before the Royal Colonial Institute, the question was asked: "What is dry-farming?" Dry-farming may be defined as the conservation of soil-moisture during long periods of dry weather by means of tillage, together with the growth of drought-resistant plants. Dry-farming differs from ordinary farming in that the chief object of the dry-farmer is to prepare his lands to receive and retain as much rain as possible. This is accomplished by the use of moisture-saving fallows.

"Dry-farming" is a new term which was first used a few years ago in Western America. In Utah and some other parts of the United States it is called "arid-farming." Still another term is "scientific soil culture." For the sake of uniformity, all experiment stations, agricultural societies and the rural Press would do well to speak of dry-farming and dry-land agriculture.

It is sometimes said that dry-farming is a new agricultural practice. But it is not so. Even in America the farmers of Utah have been raising crops on their dry lands with a rainfall of less than fifteen inches for over half a century. More than that, dry-farming has been practised since the dawn of civilization in Mesopotamia, in Egypt, and in Northwestern India. And, as Professor Hilgard, of California, remarked to the writer,* "the great depth of soil in arid regions as compared with that of humid climates undoubtedly explains how the ancient agriculturists could remain in the same country for thousands of years without having any knowledge of scientific agriculture." Most farmers are aware of the fact that the roots of plants go far deeper in dry regions than in damp climates. Now, if the roots of plants can penetrate to great depths, so surely must both moisture and air. It would thus seem as if an All-wise Providence had amply compensated the agriculturist of the arid regions by giving him in many parts of the globe great depth of soil combined with an almost inexhaustible fertility. Such, at least, is the lesson of history.

Summing up, we may say that desert regions are specially adapted to dry-farming, because as a general rule desert lands are deep lands, in which the scanty rainfall can be stored for a long period; and though arid soils are usually poor in humus, they are much richer in nitrogen than the soils of humid regions. It has been shown that the nitrogen-fixing germs are actively present in large numbers in dry soils. Finally, desert lands are usually free from malaria, and are thus well suited to colonization.

* See *Dry Farming: Its Principles and Practice*, by William Macdonald, P. 10, London; T. Werner Laurie.

THE PRINCIPLES OF DRY-FARMING.

As the writer has elsewhere pointed out[†] the English agriculturist, Jethro Tull, is entitled to be called the "Founder of the Principles of Dry-farming." It is true that Tull saw as through "a glass darkly." Today we see more clearly. But the principles which we have adopted are merely the amplification, nothing more, of those fundamental methods of tillage so plainly set forth, one hundred and eighty-two years ago, by the genius of Jethro Tull.

In his agricultural classic (1731) entitled *The New Horse-Hoeing Husbandry, or An Essay on the Principles of Tillage and Vegetation*, the inventor of the corn drill wrote: "For the finer land is made by tillage the richer will it become and the more plants will it maintain." This axiom has received ample confirmation on the arid lands of the United States and the British Empire, where the deep plowing of the virgin prairie and the thorough pulverization of the stubborn veldt sets free æons of fertility.

It was Tull who first enunciated the three great principles of the new farming: (1) Drilling; (2) Reduction of seed; (3) Absence of weed. And he left a happy epigram which at least is true for the sunlit lands oversea: "Tillage is manure."

The principles which we have adopted in our experiments on the Government Dry-Land Station at Lichtenburg, in the Transvaal, and which are now being extended to the other dry land stations throughout the Union of South Africa, are eight in number, namely: (1) Deep plowing; (2) Pure Seed; (3) Thin seeding; (4) Drilling; (5) Frequent harrowing; (6) Weedless lands; (7) Few varieties; (8) Moisture-saving fallows.

MOISTURE-FALLOWS AND THE SOIL-MULCH.

We believe that our success has been due mainly to the use of moisture-saving fallows, in which the rain is stored up in the soil for the use of subsequent crops. The supreme need of South African agriculture is not fertility but moisture. Consequently, all our cultivation is directed to establishing a moisture-saving fallow which may be maintained for periods of three months, six months, or one year. Such a fallow is deeply plowed in the first place, and then kept constantly tilled to prevent the formation of a soil-crust which would permit the moisture to evaporate. This treatment results in four things: (a) Storage of rainfall; (b) Destruction of weeds which are moisture-robbers; (c) Admission of sunshine and air; (d) Encouragement of beneficial soil-germs.

Messrs. Russell and Hutchinson, of Rothamsted, recently de-

[†] Bulletin No. 103, Union of Agriculture.

monstrated that intense sunlight destroys those harmful soil organisms which prey on the plant-food making bacteria. The illuminating researches of these scientists enable us more readily to understand the spontaneous and marvellous fertility of the lands of South Africa which are bathed in sunshine.

The germ of life of arid lands is a subject worthy of the attention of the Universities of the Empire.

The well-known term soil-mulch is deserving of a brief notice. It may be defined as "any material which is spread upon the soil to shade the surface from the sun and to break the connection between the water-bearing sub-soil and the exposed surface." Examples of mulching are familiar to everyone. Turn over a board or stone lying on the ground, and you will find that the soil beneath is moister than the ground around it, since the pores of the earth, or capillary channels, have been closed, and the current of moisture passing upward to the surface has been stopped. In the garden, leaves, straw, and manure are commonly used. But the most practical mulch is made of loose, dry soil. This is done by frequently stirring the surface of the plowed lands with a harrow or cultivator. The soil-mulch is also termed the soil-blanket.

Now the question arises: "How deep should the soil-blanket be?" The reply is: From two to six inches, depending on the state of the weather, the soil, and the crop. In orchard cultivation, during a severe drought, the soil-blanket is often made six inches deep, or even more. But for cereals the soil-blanket should seldom be thicker than two to three inches, as they are surface feeders. When sowing, the seed must be drilled into the moist seed-bed below the dry blanket, otherwise it may fail to germinate.

SUMMARY OF RESULTS.

It is doubtful if, since the time of Tull, any soil has had a severer test of his profound but forgotten principles than the dry lands of Lichtenburg in the Western Transvaal. Let us summarize what has been accomplished there.

We have shown:

(1) That by our system of tillage we are able to keep the soil seed-bed moist for a whole year. This means that, so far as moisture is concerned, we can plant a crop at any season—a most important matter in South Africa. This result has been attained by the use of moisture-saving fallows, deeply plowed, constantly harrowed, and kept covered with a dry-soil blanket which checks evaporation.

(2) That it is possible to grow dry land winter wheat and to harvest it before the season of rust.

(3) That drilling, as might be expected, is far better than broad-casting, saves seed, places the grain in the moist seed-bed, and gives a more even growth.

(4) That thin seeding, for wheat 30 to 40 pounds per acre, gives larger returns than more lavish sowing. This is due to the fact that each individual plant has more moisture, sunlight and food if given ample space.

(5) That the durum wheats have given the best results. They are the wheats which have extended the wheat-belt into the most arid regions of Western America.

(6) That the durum wheat—*Apulia*—has been grown under our dry-farming system without a drop of rain falling upon it from seed-time until harvest, which proves the efficacy of the moisture-saving fallow, and is a record in modern agriculture.

A GERMAN TESTIMONY.

A short time ago a fair-headed, blue-eyed Viking was sent from Berlin to Windhuk to grow two blades of grass where but one grew before, in the person of Mr. Walter Richter, the Agricultural Adviser to German Southwest Africa. He spent several months in British South Africa investigating our soils and crops with the skill, the patience, and the industry for which his race is so justly renowned. To our question: "What do you consider the most instructive part of your tour?" Mr. Richter replied without hesitation: "The Dryland Experiment Station at Lichtenburg. There I saw durum wheat being harvested which not only had been grown on a poor shallow soil, but actually never had a drop of rain upon it from seed-time until harvest. There, also, I saw *dry land* which is never dry the whole year round. I go back to German Southwest Africa filled with a new hope, for now I am convinced that dry-farming is destined to revolutionize our agricultural industry. Truly, as the motto of your Congress puts it: "The destiny of South Africa is on the dry lands."

Every great movement is indissolubly linked up with the personality of a few earnest workers. So it is with dry-farming in South Africa. The signal success which we have achieved is due in large measure to Captain Heinrich du Toit, a brave Boer officer of the former Staats Atillerie who bore a charmed life, as shown by marks of twenty-two bullets. Captain du Toit returned to the peaceful life of a Cape farmer. When the government dry-land station was established he was appointed manager—a post which he still holds. He has since become the tireless missionary of the new agriculture amongst the Dutch and the English settlers on the dry lands of the Union.

MOISTURE BANK AND HUMUS BANK.

Hardly a season passes but we hear of crops that have failed because of lack of rain, and this complaint is not confined to any particular dominion, but is more or less common to all parts of the Empire. Search the pages of the rural magazines, consult the

columns of the daily Press, and, sooner or later, your eye will light on that sombre line: "The crop has failed this year owing to drought." And the amazing thing is that no remedy is ever suggested, no preventive is ever proposed. Decade after decade, year in and year out, drought finds the farmer unprepared, watching sadly his withering crop in sun-scorched waterless soil.

The Alpha and Omega in the fight against drought is the moisture-saving fallow. Without it all effort is useless. With it all soil-drought disappears. Suppose we start with the bare moisture-saving fallow and we conserve six inches of rain out of a 12-inch annual rainfall. We hold the fallow for a year and then sow our wheat in a moist seed-bed. The second season another twelve inches may fall in the field, of which, say, six inches are utilized by the plants, and so, at the end of the second year, instead of one or two possible failures, we reap a 30-bushel* (12-inch rainfall) crop of wheat. The establishment of a moisture savings bank to pay cash on demand is the fundamental principle in dealing successfully with recurrent seasonal droughts. This practice is strongly advocated by the foremost Australian authority on dry-farming, Sutton of New South Wales, who writes:

"In dry districts a proper system of fallowing is therefore an essential of success, and the general adoption of a proper system in our wheat districts is a factor which will do more than any other to remove wheat-growing from the area of speculation and place it on a sound and solid basis. With a proper system in practice, the rainfall of the previous, or a portion of the previous year, can be stored, conserved, and utilized for a subsequent crop."

And he closed an instructive address to an assemblage of farmers with these words: "Go back home and fallow till harvest time, and when the harvest is over, start to work the fallow and keep at it until seed-time."

It may be said that the practice of growing crops on only half of the arable land and maintaining the other half in clean fallows means a good deal of extra labor. That is so, but it also means a certain crop in seasons of drought. It may be said that the continuous cultivation of the moisture-saving fallows will eventually burn out the vegetable matter in the soil. It may be so; but the remedy is at hand. On worn-out fallows you can always grow green legumes, fill the soil with nitrogen, and so gradually establish a humus bank. These two saving banks—the Moisture Bank and the Humus Bank—will secure the farmer against the severest drought and make possible a permanent fertility on the dry-lands of South Africa.

* Widsøe calculates the crop-producing power of rainfall as follows:
 One acre inch of water will produce $2\frac{1}{2}$ bushels of wheat.
 Ten acres inches of water will produce 25 bushels of wheat.
 Twenty acres inches of water will produce 50 bushels of wheat.

The prospect of a year of drought is the favorite topic of conversation for those lukewarm Laodiceans who, by idle criticism, vainly try to check the progress of dry-farming. Drought to the intelligent dry-farmer is no more than a passing storm to the skilful mariner at sea. Before us lie two authentic records of farms where the year of drought brings no dismay. These records are taken from the admirable work on dry-farming of the most eminent American authority, Dr. John H. Widtsoe of Utah. The first farm belongs to Senator Barnes of Utah, and is situated in the Salt Lake Valley. The climate is semi-arid, the summers are dry and the evaporation large. Over a period of nineteen years crop and rainfall records have been most carefully kept. There has been only one crop failure, and that was the first, when the land was not yet properly tilled. The heaviest crop of wheat, 29.8 bushels, was harvested in the year 1902, when next to the lowest rainfall occurred, which varied from 10.33 inches to 18.36 inches. Moisture-saving fallows followed every crop.

A second and equally instructive record is furnished by the Government Experiment Farm at Indian Head in Saskatchewan, Canada. Here also reliable records have been kept for the same period—viz., nineteen years. Not a single crop failure is recorded. The highest yield was forty-nine bushels to the acre, the lowest seventeen. During this period the rainfall varied from 3.9 to 20.22 inches (snowfall not included—varying from 1.3 inches to 2.3 inches of water). Here also moisture-saving fallows followed every crop.

These experiments clearly show that the year of drought need not be feared when the principles of dry-farming are properly carried out. In the conservation of soil moisture lies the ultimate conquest of drought. And in place of the barren desert, abandoned homes, and dying cattle, we can now paint a new and glowing picture. There, under a serene and cloudless sky, lies a panorama of green and chocolate-brown—mile after mile the growing wheat and the deep-stirred, water-holding fallow. No rain may fall for many a day, but the husbandman is untroubled. For he knows that his seed has fallen upon good ground, and that, from far below, those life-streams are flowing ever upward which will carry his hundredfold corn white unto the harvest.

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Board of Agriculture and Forestry

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The Board of Commissioners issues for general distribution to persons in the Territory, annual reports, bulletins, circulars, copies of its rules and regulations, and other occasional papers, which may be had, free, upon application.

A complete list of the publications of the Board available for distribution (together with the titles of certain issues now out of print) is to be found on the cover of the last biennial report.

Applications for publications should be addressed to the Mailing Clerk, P. O. Box 207, Honolulu, Hawaii.

DIVISION OF HYDROGRAPHY.

Rooms 20-22 Kapiolani Bldg. Tel. No. 3662.

The Division of Hydrography has on hand free publications relative to the water resources of the Hawaiian Islands. These publications furnish detailed data as to daily, monthly, mean, maximum, and minimum run-off of streams and ditches, and also cuts and maps pertaining to the different islands. Much descriptive data relative to the mountain ranges and physical configuration of each island are also contained. These publications will be mailed free of charge on request.

The United States Geological Survey topographic map of Kauai is also on sale, and copies will be mailed on receipt of 50 cents.

The records and maps of this division are available for inspection by any one who desires information relative to water resources, topography, etc. Blue print copies of hydrographic data relative to any stream, ditch, spring, etc., which may be under observation by this division will be mailed free of charge on request.

This division will also make ditch seepage losses and utilization investigations when the actual cost of the labor, materials, subsistence, transportation, etc., of such investigations is paid by those benefited.

G. K. LARRISON,
Superintendent of Hydrography.

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FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

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All communications in regard to seed or trees should be addressed to David Haugs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

C. S. JUDD,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent of Entomology.

THE HAWAIIAN FORESTER AGRICULTURIST

VOL. XII.

MAY, 1915.

No. 5

HEN FLEAS AND ANTS.

Dr. Illingworth's article in this number, on the hen flea, will be welcomed by poultry raisers here, as the pest mentioned is one of the things that make people who keep a few hens for domestic economy's sake tired of the gentle industry. By following the directions in the paper they may hope to get rid of this particular nuisance.

An interesting point in the article is the reference to the work of the small brown ant in getting away with these fleas. If the little "brownie" is a benefactor in this respect, its character is different from that given, with respect to injurious plant insects, to the small black biting ant. A letter from a planter in the Seychelles group, forwarded by the curator of the botanic gardens in Dominica to the Agricultural News, arraigns the little black fellow as a mischief worker. It is charged with transplanting the larvae of certain noxious scales from their birthplaces to the leaves of valuable fruit trees and plants, such as grafted mango, young orange shoots, pineapples, etc. The writer of the letter says:

"Personally I have been convinced for a long time that the ant is responsible for the spread of many injurious insects. It roams over the whole land here, and I believe it selects by instinct or by trial every plant or tree that suits those insects of which it can make use and then starts the colonies of them. I am under the impression that the large black biting ant also cultivates insects for use, but in this case altogether underground and possibly on roots. If there is any practicable method of abolishing ants, I should be very glad indeed to hear of it."

DIVI-DIVI A VALUABLE DYE SOURCE.

Introducing the following article from the Board of Trade Journal for December 24, 1914, the Agricultural News (W. I.) says that divi-divi has often been mentioned in its columns, and that the commercial product consists of the pods of *Caesalpinia coriaria*, which is a native of the tropical regions of America and occurs in West Africa:

"The board of trade committee for chemicals and dye stuffs has received the following information from a reliable source: Divi-divi is a very useful dye extracted from the seed-pod of a

small tree which grows wild in almost inexhaustible quantities over the arid regions of the peninsula of Goajira. The product is collected by the native Indians, part being taken to Rio Hacha and part to Maracaibo in Venezuela, whence it has hitherto been taken in sailing ships to Curaçao and thence to Hamburg, which is the distributing center for the rest of Europe. The bulk is disposed of in Russia.

"Up to 1895, all the divi-divi was shipped to the United Kingdom, but the trade was then diverted to Germany, owing to the greater facilities offered by German commission houses, mainly in the direction of financial accommodation, and cheap warehousing.

"Divi-divi is usually shipped loose, but it is not difficult to reduce the bulk by compressing it into bales; in this form the freight is reduced by about one-half, and the product also fetches a higher price.

"In regard to the volume of business to be done, the following figures will be of interest. Official data from the custom house at Rio Hacha give the export for the last five years as 2075 tons in 1909, 3895 tons in 1910, 5997 tons in 1911, 1246 tons in 1912, and 2078 tons in 1913. The price varies between \$40 and \$50 per ton, and the freight between \$5.50 and \$10.40.

"In addition to shipments from Rio Hacha, a very considerable amount finds its way to Curaçao direct from the Goajira coast-line by coasting steamers, and shipments are made from Maracaibo about equal in volume to those from Rio Hacha."

In his reference to hog cholera, in his March report, Dr. Norgaard offers a caution against the "serum simultaneous method"—which he explains—as carrying danger of infection and unjustifiable except in the event that a virulent form of the malady should appear and spread to many herds. Happily, the report shows that hog cholera at the time of writing was well under control in the Territory.

It would appear from the veterinarian's report that little need be feared from cerebro spinal meningitis among equine stock in these islands if the advice of the division respecting feed be followed.

That bovine tuberculosis control will not be allowed to lapse, after the grand record that has been made since it was started five years ago, may be gathered from Dr. Norgaard's statement in his report in this number, taken in connection with municipal assurances. Cattle testing, according to this, will still be done for "dairymen and cattle owners who apply for the test." Therefore, if the virtual pledge given by the chairman of the sanitation committee of the board of supervisors, that the milk ordi-

nance will be fully enforced, be faithfully observed, it will be necessary for all dairymen supplying milk to the community to procure certificates from competent veterinarians that their milk-giving cows are free from tuberculosis.

Importation of pure-bred-live stock and high grades of poultry continues to be recorded from month to month, materially advancing the solution of the problem of subsistence, for the population of Hawaii, to the full capacity of profitable home production.

Effective work was done again in March, by the division of entomology, both in the exclusion of pests arriving at the territorial gates and in the prosecution of noxious fly control.

Among other applications for permits for economic utilization of hitherto unconsidered forest products, on the government reserves, an important one seems to be that for the gathering of kukui nuts as raw material for the manufacture of kukui nut oil on a commercial scale. According to what has appeared in the press, at various times, this ought to become an important addition to the list of small local industries.

With funds now available, the division of forestry is going to add largely to the mileage of forest reserve fencing. In this matter, as well as in that of vigilance against fires, Hawaii continues to maintain a creditable record in public forestry.

With 7332 plants to the general public and 5550 to corporations distributed in March, besides 1100 kukui trees planted above the city, a degree of progress in covering the waste places of hill, plain, valley and home plots with watershed protection, shade and ornament is indicated by the forest nurseryman's report, which is exceedingly pleasant to contemplate. Many can remember the time when writers of books on the Hawaiian Islands contrasted their brown and barren appearance from the ocean with the emerald gorgeousness of groups in southern Polynesia. The dismal aspect of Hawaii thus described is fast disappearing.

If the algaroba tree seed going from Hawaii to China work the transformation of landscape in that country which the lone tree, still preserving vitality at the Catholic mission here since it was planted by Father Bachelot in the first half of last century, did throughout these isles, "Far Cathay" will more than ever be entitled to be called the celestial empire.

There is nothing of especial moment in the report of the division of hydrography for March, but enough to show that the

chief and his staff are kept busy all the time. Results of this branch of the agricultural bureau's services will become more valuable and appreciated as the years pass. Righteousness is truly declared in Hawaii's motto to be the "life of the land," but water in its way is equally an essential element in the country's vitality.

DIVISION OF ANIMAL INDUSTRY.

HOG CHOLERA.

Honolulu, March 31, 1915.

To the Commissioners of the Board of Agriculture and Forestry.

Gentlemen:—I am pleased to report that the hog cholera situation appears to be favorable in a general way to the hog industry. There have practically been no losses during the past month and the largest hog raiser on this island, who has in the neighborhood of 900 head, has lost less than half a dozen large animals during the past three months, and only a comparatively small number of young pigs have succumbed to pneumonia. It has therefore not been necessary to resort to serum injections on a large scale, but experiments with pneumonia serum have been carried on at this place, as well as at Mr. Atkinson's ranch near Watertown. No definite results have so far been obtained from these experiments, but it is believed that if applied systematically a considerable percentage of young pigs may be saved by this treatment.

In regard to the general injection of hog cholera serum together with hog cholera virus, that is the so-called "serum simultaneous method," and which several hog raisers have been desirous of applying to their herds in order to protect them against any hog cholera infection which might possibly remain here, I wish to quote from a magazine recently received, as follows:

"In sections where hog cholera is not present and has not prevailed for a year or more it is unwise to use anti-hog cholera serum, and *it should be illegal for anyone to apply the simultaneous method.* Under such conditions no protection is needed, and the immunity produced by the use of serum alone is not economically justifiable, while the use of virus no doubt infects premises where it is used and thus centers of infection are established in a cholera free zone."

This would seem definitely to support the stand taken by this division, that is, that hog cholera virus should not be introduced here unless a virulent form of hog cholera should make its appearance and spread to many herds in the Territory.

From Mani Dr. Fitzgerald reports that he has had good success with the serum treatment at the Grove Ranch outbreak.

while a few cases continue to appear on the Haleakala Ranch. On Hawaii a few scattered cases have occurred but no outbreak of any importance has been reported.

CEREBRO SPINAL MENINGITIS OR FORAGE POISONING.

Referring to the outbreak in a plantation stable on this island, reported on last month, only one more animal became affected, since which time the disease seems to have died out. The total loss was therefore eleven mules and two horses, which constitutes the largest outbreak occurring here for a number of years. The samples of feed forwarded to Prof. Rock of the College of Hawaii for examination were found, so far as the barley was concerned, to contain a large amount of various fungi which, in Prof. Rock's opinion, made it absolutely unfit for use as a feed. The bran, on the other hand, was found to be in good condition. A copy of Prof. Rock's letter has been forwarded to the manager with advice that the balance be not used as feed for horse stock at least. At a recent visit by Dr. Fitzgerald to Kohala, Hawaii, he was called by Mr. Watt to examine a number of mules which he found to be affected with spinal meningitis. Besides this a few scattered cases have occurred at the City of Honolulu.

BOVINE TUBERCULOSIS CONTROL WORK.

Little testing has been done during the past month principally because a number of dairymen are waiting for the passage of a bill before the present legislature providing indemnification for the destruction of tuberculous animals. However, all the she stock on the Waianae Ranch, comprising 240 cows and 100 heifers, together with four bulls, were tested and 20 reactors found. Of these 344 head at least one-half had never been tested before, while of the 20 reactors only three head showed ear-marks indicating a previous test. Only one of the bulls reacted.

Until some definite conclusions have been reached in regard to future testing, it is the intention of this Division to confine this work to dairymen and cattle owners who apply for the test, unless other instructions are received from the Board. From the Island of Hawaii Dr. Elliot reports having tested 110 head belonging to different owners, without finding a single reactor. He will begin testing the Honokaa and Paauhau herds next month.

IMPORTATION OF LIVE STOCK.

There arrived during the month of March an unusually large number of animals, among which were 149 mules, 97 being quarantined in Honolulu and 52 on Maui. A number of pure-bred hogs for breeding purposes, principally Berkshire boars,

were received, but only three dogs. Poultry continues to arrive in steadily increasing numbers, not less than 131 crates arriving during the month. By far the larger proportion of these consisted of common or cross-bred Leghorns, every crate containing five or six dozen. Of the high class birds may be mentioned four crates of Black Minorcas and a few crates of Buff Orpingtons and Barred Plymouth Rocks.

From Hilo Dr. Elliot reports the arrival and quarantine of 29 mules and one horse, besides five crates of poultry.

Respectfully submitted,

VICTOR A. NORGARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, April 31, 1915.

Dr. A. V. Norgaard, Chief of Division of Animal Industry.

Sir:—I beg to submit the following report for the month of March, 1915:

TUBERCULOSIS CONTROL.

The following dairy cattle were tested during the past month:

	T.	P.	C.
Leahi Home	2	2	0
Waianae Ranch	344	324	20
Capt. Hartman	4	4	0
E. W. Williamson.....	6	5	1
J. H. Cummings.....	6	6	0
W. E. Wall.....	4	4	0

From the above list it will be seen that a total of 366 head of dairy cattle received the test out of which number 21 head were condemned and branded.

IMPORTATIONS OF LIVE STOCK.

Matsonia, San Francisco: 13 crates poultry; 1 box rabbits, W F X Company; 1 dog, G. A. Marshall; 1 dog, Mrs. Robert Laing.

Sierra, San Francisco: 1 crate pigeons, W F X Company; 3 crates poultry, F. F.

Lurline, San Francisco: 16 mules, McBryde Sugar Co.; 12 mules, H. S. Company, Kauai; 48 mules, Schuman Carriage Co.; 2 Berkshire boars, E. O. Hall & Son; 13 crates poultry. Kahu-

lui—52 mules, Maui Agr. Company; 1 crate poultry; 2 crates poultry, F. F. Baldwin.

Wilhelmina, San Francisco: 29 crates poultry.

Mexican, Seattle: 2 crates poultry, E. W. Jordan.

Manoa, San Francisco: 21 mules, Honolulu Plantation Co.; 10 Merino rams, Hind, Rolph & Co.; 7 Berkshire boars, 1 Berkshire sow, Club Stables; 25 crates poultry.

Dakotan, Seattle: 1 crate poultry.

Matsonia, San Francisco: 31 crates poultry; 1 crate pigeons, 1 crate rabbits, W. F. X. Company; 1 dog, J. B. Laing.

Respectfully submitted,

L. N. CASE,
Assistant Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

Honolulu, March 31, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the work performed by the Division of Entomology for the month of March, 1915, as follows:

During the month 42 vessels arrived at the port of Honolulu of which 24 carried vegetable matter. Six vessels came by the canal route and were boarded and inspected.

<i>Disposal.</i>	<i>Lots.</i>	<i>Parcels.</i>
Passed as free from pests.....	919	22,122
Fumigated	8	8
Burned	48	50
Returned	8	8
	<hr/> 983	<hr/> 22,188

Of these shipments 21,802 packages arrived as freight, 290 packages through the postoffice and 96 packages as baggage of passengers and immigrants.

RICE AND BEAN SHIPMENTS.

During the month 40,560 bags of rice and 2953 bags of beans arrived from Japan, also 220 bags of wheat from the Orient. After a thorough inspection all these shipments were found free from pests and were allowed to be delivered.

PESTS INTERCEPTED.

Thirty-two packages of fruit and 14 packages of vegetables were taken from the baggage of passengers and immigrants from foreign countries, and were destroyed by burning. One package of rose plants infested with rose aphid was fumigated before delivery. Three shipments of ornamental plants and palms arrived from Florida. These shipments were found infested by scale insects (*Coccus herperidum*), (*Pseudococcus pseudonipae*) and the palm aphid (*Cerataphis lataniae*). Two plants (*Warneria thunbergia*) were badly infested with the citrus whitefly (*Aleyrodes citir*) bearing its fungus (*Aegerita webberi*). After all the shipments were fumigated these two plants were taken out of the shipment and were destroyed. Six packages of seeds, one package of plants and one package of fruit arrived by mail from foreign countries and were returned to original postoffice under the ruling of the Federal Horticultural Board as being unmailable.

BENEFICIAL INSECTS.

Mr. D. T. Fullaway has continued with the breeding of the various parasites for the fruit and horn fly. During the month particular stress has been given to the recently introduced parasites and their distributions in various sections as recorded by him in the appended report. Added to this was the regular liberation of surplus parasite material of Silvestri's introductions which, owing to the breeding and upkeep, are liberated after certain periods, also the distribution of surplus horn fly parasites for similar reasons.

HULL INSPECTION.

Brother M. Newell reports the arrival of eight steamers of which five brought vegetable matter consisting of 162 lots and 2000 packages, which were found free from pests and were passed for delivery.

INTER-ISLAND INSPECTION.

During the month of March 65 steamers plying between Honolulu and the ports of the other Islands were attended to and the following shipments were inspected and passed. Plants, 140 packages; taro, 643 bags; vegetables, 69 packages; fruits, 10 packages; total inspected and passed, 862 packages. The following packages were refused shipment on account of infestation or of having undesirable soil attached to the plants: Plants, 7 packages; fruit, 13 packages; total refused shipment, 20 packages.

I desire at this time to report having received from Mr. W. M. Giffard 34 boxes of pinned insects as a present to the Board of Agriculture and Forestry. These insects represent many of the rare endemic species of our fauna and were collected and mounted by Mr. Giffard during the last ten years. Roughly estimated there are about 3800 specimens, all nicely mounted and labeled, and representing insects from all the islands of the group. This donation adds much to our own collection and supplies many vacancies which would take years to fill.

Respectfully submitted,

E. M. EHRHORN,
Superintendent of Entomology.

REPORT ON PARASITES.

Honolulu, March 31, 1915.

E. M. Ehrhorn, Esq., Superintendent of Entomology.

Sir:—I submit herewith my report on the operations of the insectary during the month of March, 1915:

PROPAGATION.

Diachasma fullawayi—782 females and 1564 males.

Diachasma tryoni—115 females and 230 males.

Tetrastichus giffardi—7625.

LIBERATION.

Diachasma fullawayi—781 females and accompanying males.

Diachasma tryoni—28 females and accompanying males.

Tetrastichus giffardi—9200.

The *Tetrastichus* was liberated as follows:

Nuuanu Valley, 3800; Insectary, 3700; Maunawili, 500; Punahou, 100; Kalakaua Ave., 100; U. S. Experimental Station, 1000.

The African *Diachasma* was liberated as follows:

Nuuanu Valley, 285; Insectary, 293; Maunawili, 8; Kaneohe, 25; Campbell's Piikoi St., 60; U. S. Experiment Station, 110.

The Australian *Diachasma* was liberated as follows:

Nuuanu Valley, 12; Insectary, 8; U. S. Experiment Station, 8.

The number of pupae handled during the period corresponding to the above emergence was 26,200 for *Diachasma fullawayi* and 1739 for *Tetrastichus giffardi*. The percentage of parasitism estimated on these figures is less than 1% for the former and 3% for the latter.

Respectfully submitted,

D. T. FULLAWAY.

DIVISION OF FORESTRY.

Honolulu, April 12, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit the following routine report for the Division of Forestry for the month of March, 1915:

PERMITS.

Wahiawa grass cutting. On March 8 a permit was issued to the Hawaii Preservation Co., Ltd., to cut grass on the land of Wahiawa within the Ewa forest reserve, Oahu. The permit, which runs until May 30, and is revocable before then on seven days' notice, requires the exercise of precautions in preventing forest fires and assistance in fighting them should they start, prohibits the cutting and removal of anything but grass, and requires the payment of all damages resulting from any misuse of the permit. The company desired the grass for fertilizer on its pineapple fields and it is being taken from the land in Wahiawa where formerly a severe fire occurred. A local resident has since expressed his opinion that this grass cutting is an excellent thing, because it here grows long and in dry weather becomes as dry as powder and is a great fire menace.

APPLICATIONS.

Tantalus. During the month an application to cut honohono on Tantalus was refused after a personal visit showed that in most places in this forest this herb was very short and was required as a moist, ground cover.

Awa. By reference from the Governor, an application was received from J. K. Kapunihana and J. Keola Kuhiike of Keanae, Maui, to take awa from the government forest on Maui. Since the application was indefinite as to locality, and only a part of the land in the Koolau forest reserve, Maui, is under the control of this Board, I at once wrote to the applicants requesting them to inform me of the exact lands from which they wished to gather this root, in order to ascertain whether or not the matter came under our jurisdiction. I also wrote to Messrs. W. F. Pogue and George C. Cooper, of Huelo and Hana, Maui, respectively, who have had experience in the matter of taking awa from the reserves, and have received from them suggestions which will help in taking suitable action on the present application if it is found that the matter is under our control.

Kukui nuts. On March 25 an application was received from Geo. H. Rice of Honolulu to take for a term of years fallen kukui

nuts from the lower government lands in the forest reserve in Palolo Valley. If he can secure permission to take kukui nuts from other lands in Palolo as well as from the forest reserve, Mr. Rice plans to establish an oil extraction outfit with the idea of putting kukui nut oil on the market. He believes that he can sell the oil for about the same price as linseed oil—75 cents per gallon. Since I can see no way in which the forest would be injured by the gathering of the fallen nuts and I believe that an industry of this nature should be encouraged, it is my plan to issue, with your approval, a preliminary permit to Mr. Rice for this purpose, making a nominal charge for the nuts of say 5 cents per hundred pounds, this price to be readjusted after experiments have determined how much oil can be extracted from 100 pounds of nuts.

Kahoolawe. During the month two applications were received for privileges on the Kahoolawe forest reserve; one from Ed. K. Duvauchelle of Pukoo, Molokai, to shoot goats on the island, the other from W. J. Coelho of Honolulu who desires the sole privilege of occupying the island for 20 years free of rent in order to establish a fishing station, and stock the island with game birds and poultry. In return he would kill off the goats and plant trees on the island. In view of the fact that the former tenant of the island has not yet removed all of his sheep and may claim that he still has rights there, it would seem that these two new applications should not be considered until there is some definite understanding as to future plans concerning the island. With this in view I intend soon to take up the whole question with you in the form of a special report.

FOREST FIRES.

A report of forest fires in the woods back of Olaa, Hawaii, during March led me to inquire from District Fire Warden C. F. Eckart of the Puna district as to their extent and he has informed me that there had been four fires in the mauka lands to the southeast of the Olaa section, but that at the end of the month showers had extinguished them. A later report from Mr. Eckart showed that after a personal examination no evidence of fire was found in the forests on government lands or in any other heavily wooded land in that section. The fires had all been on pasture lands controlled by the Shipman interests.

HILO FOREST RESERVE.

Concerning the question, referred to the President by the Governor, of a possible elimination for homesteading of land at the northwest corner of the Hilo forest reserve, Hawaii, on the land of Humuula, I found that the matter had been before the Board

in 1907 and 1909, when the Board decided each time that the boundary of the reserve at this point should not be changed, and that the upper edge of the forest should not be opened up. The Governor was informed that the Board saw no reason at present why its former stand on the matter should be changed.

FOREST FENCING.

On March 18 the Governor allotted \$20,000 from the water license fund for the construction of forest fences. Since the money is immediately available I have already made inquiries concerning suitable fence wire and with Mr. von Holt's advice have decided to use No. 8 galvanized wire and to call for bids on a sufficient amount to fence 20 miles of boundary, for a beginning. During April I plan to visit Kauai to secure data for specifications to construct the fences needed on that island.

SEED FOR CHINA.

The appended report of the forest nurseryman shows the activities in his department during March. To assist in colonization work in China one-half pound of algaroba seed and small packets of seed of 37 other varieties were sent to Professor Joseph Bailie of the University of Nanking, Nanking, China.

Respectfully submitted,

C. S. JUDD,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, April 12, 1915.

C. S. Judd, Esquire, Superintendent of Forestry.

Dear Sir:—I herewith submit a report of the principal work done during the month of March.

NURSERY.

Distribution of Plants.

	In seed boxes.	In boxes trans- planted.	Pot Grown.	Total.
Sold	1500	...	208	1708
Gratis	4000	480	1144	5624
	<hr/> 5500	<hr/> 480	<hr/> 1352	<hr/> 7332

Realizations.

Collections on account of plants sold amounted to.....	\$4.95
Total.....	<u>\$4.95</u>

PRESERVATION FOREST RESERVES.

Collections.

Rent of premises at Half Way House, Tantalus, \$10 per month, January, February and March.....	\$30.00
Fee for use of land and gathering Ti leaf on Kalawahine, Pauoa Valley, \$50 per year, Jan., Feb. and March.....	12.50
For use of two acres of land on Kalawahine in Pauoa Valley at \$10 per acre per year, Jan., Feb. and March.....	5.00
Total.....	<u>\$47.50</u>

PLANTATION COMPANIES AND OTHER CORPORATIONS.

The total number of trees distributed under this heading amounted to 5550. (In seed boxes, 2000; in boxes transplanted, 2800; pot grown, 750.)

MAKIKI STATION.

The work done at this station has been principally routine, consisting of transplanting into boxes and pots, mixing and sterilizing soil and attending to the plants in stock.

HONOLULU WATERSHED PLANTING.

During the month 1100 kukui trees were planted. Other work done consisted of hoeing and clearing away weeds and grass from the trees formerly planted. Patches along the Ewa side of Herring Valley will be the next part of the work to be taken up. The Sugar Loaf and Round Top section is practically finished. A new trail from Makiki main valley across the ridge will have to be made for the convenience of the men while at work, also for packing trees.

ADVICE AND ASSISTANCE.

The writer has been called upon to make visits and otherwise give advice and assistance, as follows: Number of visits made,

13; persons calling for advice by telephone, 11; persons calling at nursery for advice, 15; advice by letter to other islands, 6; total, 45.

Respectfully submitted,

DAVID HAUGHS,
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

Honolulu, April 13, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the Division of Hydrography during March, 1915, is submitted:

WEATHER CONDITIONS.

Reports from all islands indicate serious conditions of drought. The discharge of East Maui ditches is the lowest on record—a total discharge of about 45 million gallons per day. The mean discharge of these ditches has been about 125 million gallons per day, and the maximum capacity is about 225 million gallons per day. The low discharge of East Maui ditches is typical of practically all other ditches on all islands.

UTILIZATION INVESTIGATIONS.

Little work was done in this line. A few check measurements were made on Kahuku plantation and for the Heeia Agricultural Company. An attempt was made to make seepage investigations on the ditches of the Maui Agricultural Company and the Hawaiian Commercial & Sugar Company on Maui, but through a misunderstanding the control of the water in the ditches was not satisfactory and the work was postponed.

KAUAI.

Mr. W. V. Hardy, formerly in charge of Kauai, returned from the mainland on March 13 and resumed charge of the island. The new continuous record stream gaging station installed in coöperation with the Hawaiian Sugar Co. was completed. This station, in connection with the Olokele ditch measurement station, will show the entire run-off from the Olokele upper valley.

Construction work on the new Kapaa river continuous record gaging stations was started and will be completed in April.

Ten stream measurements were made and ten mountain rain gages were visited during the month. A new copper rain gage

of 300 inch capacity will be re-established on Waialeale, 5070 feet elevation, during April.

G. K. Larrison spent March 17 to 20 on reconnaissance in the Kapaa and Anahola river valleys.

OAHU.

A large amount of small repair and maintenance work was done. New staff gage faces were put in at 12 stations. Six steel cables and iron parts of cars and equipment were oiled and painted. The location of the three new coöperative stream gaging stations to be built in coöperation with the Koolau Agricultural Co. in the Punaluu and Kaluanui stream basins was decided on and construction work was started on these stations. Mr. Austin visited 21 stream gaging stations and made 21 stream and ditch measurements at regular stations, and five miscellaneous measurements. Mr. Kimble, assistant engineer, left for the mainland on the March 8 transport on leave. His resignation from the service will take effect March 31, 1915.

MAUI.

Outside of a few seepage measurements made on the Maui Agricultural Company and the Hawaiian Commercial & Sugar Company ditches, which were not successful, only routine work was done. All continuous record stream gaging stations were visited, and two stream measurements were made.

HAWAII.

On March 31, G. K. Larrison accompanied the deputy attorney-general to Waimea, Hawaii, to gather evidence for the Territory in connection with the Waikalooa water case which is soon to be brought to court.

APRIL PLANS.

In addition to routine operation and maintenance work, the following special work is planned:

Kauai.—Complete Kapaa measurement stations above homesteads.

Oahu.—Complete Punaluu and Kaluanui coöperative stream measurement stations.

Hawaii.—Complete special hydrometric work for the attorney-general's office in connection with the Waikalooa stream waters.

Very respectfully,

G. K. LARRISON,
Superintendent of Hydrography.

HEN FLEAS.

Xestopsylla gallinacea (Westw.).

By J. F. Illingworth, Ph. D., Professor of Entomology,
College of Hawaii.

Apparently these fleas are rather recent arrivals in the Territory; the entomologists not having noticed them prior to 1913. The earliest specimens in the College collection were taken in November of that year. It would be interesting to know just when and how they were brought in, and how widely they are distributed in these Islands. Looking to this end, the College of Hawaii would welcome any definite information, on these points, from poultry owners or others. Just a postcard, stating when you first noticed the fleas and giving the locality, will assist greatly in making the survey.

Unlike ordinary fleas, this species has a habit of attaching itself, permanently, while feeding; hence they are easy to catch, although hard to pull off from the skin. They have been called the "hopless flea," but this is a misnomer, at least, when they are not attached. Active specimens are able to jump out of a jar 5 inches high.

HOSTS.

Although these are called the hen fleas and their normal hosts are poultry, they will, apparently, attack any other animals that come within their range. They have been recorded from dogs, cats, horses, rats, owls and man. They are particularly fond of young animals, and, hence, sometimes very annoying to children. Young cats and dogs often have their ears covered with them. In East Africa it was found that 22.5 per cent of the fleas attacking rats belonged to this species, hence, they were thought to be an important agent in the distribution of this pest. Recently, the writer discovered that the English sparrows, that flock in the chicken houses to the feed boxes, are also infested; and these may act as a rapid agent of carrying them from house to house.

DISTRIBUTION.

Although Westwood described this species as an inhabitant of India, in 1874, it is now pretty generally distributed around the world; favoring tropical and sub-tropical regions. It has been recorded in the southern U. S. since 1890; and one record extends as far north as Minnesota. Since these fleas are found in California it is quite probable that they came to us, on poultry, from the Coast.

LIFE HISTORY.

The development of this species resembles that, already known, of other common fleas. The earlier writers on the hen flea supposed that eggs might be retained and hatched within the body of the parent, as is the habit of the Jigger Flea (*Sarcopsylla penetrans* L.), of the Southern States. We have been able to trace through the entire life cycle, and hence can work more intelligently in combating them.

The female fleas remain attached after they have found a suitable host, the eggs being dropped as fast as they are produced. Evidently the egg laying goes on very rapidly at night, for the roosting board, under infested fowls, is always thickly covered with them, in the morning. The eggs are very small, of course, and resemble small white specks, just visible to the naked eye. With a lens they appear as beautiful, pearly white, oval objects, about one-third longer than wide. Fleas removed from the hens and placed in vials produced eggs at once; using these, the incubation period was easily determined—the young hatching in $3\frac{1}{2}$ to 4 days.

Some difficulty was at first experienced in feeding the larvae, until it was discovered that they, too, like other common species, live on dried blood particles in the dust. Examining the attached fleas, the writer saw that the blood of the fowl was rapidly passing through them, and being dropped in the form of small coagulated pellets. It had already been noticed that the food in the stomach of the larvae, collected on the roosting board, showed through the skin, a dark-red color, and the literature on other species indicated that they possibly feed upon this excrement of the parents. In the test tubes containing these dry pellets of blood, mixed with the dust, the fleas were easily reared to their adult stage.

The larva is a small, wormlike creature, and even when fully developed is only about 3 mm. in length. Normally, they are covered up in the dust, but if they are stirred up, and placed on top, they quickly wriggle in again. When ready to pupate the larvae become pearly white, with the alimentary canal empty and the body stored with fat. The larval period was found to vary considerably—lasting from 6 to 10 days. When ready to pupate the larva spins a delicate cocoon, of the finest silk, which holds the particles of dust together, about it. Often the cocoons were made against the side of the glass tube, so that one could see through and note the transformation inside. After building the cocoon the larva rests from 3 to 4 days, doubled up inside, before pupating. The pupal stage lasts from 6 to 9 days; the pupa beginning to turn dark several days before emerging. Thus the entire life cycle from egg to the adult fleas takes from 3 to 4 weeks.

CONTROL.

The writer recently discovered that the small brown ants (*Pheidole megacephala*) were mortal enemies of these fleas. They were seen swarming over the roosting-board and carrying off both the eggs and the larvae of the fleas. This ant is already recognized as a most valuable friend, from its habit of destroying the larvae of house flies, as well as many other destructive pests.

The water treatment, used against the larvae of ordinary fleas, has proved most effective for these. Soon after discovering the infestation of his hens, the writer began using the hose, washing out the hen house every morning. Within a week the fleas on the chickens became noticeably less; and after two weeks treatment they practically disappeared. The idea is, that the young cannot exist under moist conditions, and, if the larvae are kept from developing, the fleas on the fowls will soon disappear; there being no newly emerged ones to take the place of those that die and drop off.

Investigation showed that most of the reports of infestation came from dry localities, and it was found that our wet districts are not troubled. Using the water treatment, however, one must recognize that the fleas are apt to breed in the dust in the yards as well as in the roosting place. If these is a place where the fowls dust themselves, it should be thoroughly wet down, at least once a week—a light sprinkling of the surface is not sufficient.

In the case of house animals such as dogs or cats, that become infested, creolin can be used with good results. A 5 per cent solution may be used for spraying their houses, bedding, etc. This same treatment may prove valuable in ridding dwellings of fleas, where a free use of water is not practicable. For the treatment of the animals, themselves, weaker solutions should be used as follows:

For dogs, 3% sol.—about 5 teaspoonsful to a quart of water. Cats, fowls, etc., 2% sol.—about 3 teaspoonsful to a quart of water.

A FRUIT FLY ATTACKING PAPAW FRUITS.

The Journal of Agricultural Research for September 12, 1914, published by the U. S. Department of Agriculture, contains an article entitled Papaya Fruit Fly. The papaya of the Southern United States is the West Indian papaw (*Carica papaya*), and as this plant has some importance from an economic point of view, in certain of these islands, a brief abstract of the paper mentioned above, which appears under the joint authorship of Messrs. Frederick Knab and W. W. Yothers, may be of interest to readers of the Agricultural News, says the latter journal.

The insect which forms the subject of this paper is *Toxotrypana curvicauda*, Gerstaecker. It was first brought to the notice of the U. S. Department of Agriculture in 1905, when it was bred from a maggot-infested papaw fruit, from the subtropical plant introduction field station at Miami, Florida. Since that time, the increasing importance of the papaw as a possible commercial crop has led to investigations in connection with this insect.

The papaw fruit fly is now recorded as occurring in the southern part of Florida, in Costa Rica, Yucatan, Brazil, Peru, Porto Rico, Bahamas, and St. Jean (? St. Jan) Danish West Indies. It is stated that this last record has been erroneously given at St. John, Antigua.

Description—The adult papaw fruit fly (*Toxotrypana curvicauda*) belongs to the dipterous family Trypetidae and exhibits a certain superficial resemblance to a common brown wasp (*Polistes*). This is due not only to its similarity of size, form, and general coloration, but in life this is accentuated by the manner in which it walks about on the fruit, with its body well elevated upon its slender legs, and by a certain nervousness of movement. The female is remarkable for its long and slender curved ovipositor, which exceeds the length of its body.

The egg. The eggs were procured from gravid females by dissection. The number of eggs produced by a single female appears to be slightly in excess of 100; the counts from two females, both showing a distended abdomen and probably containing a nearly full complement of eggs, gave 103 fully developed eggs in each case. No eggs in process of development were present, which indicates that all the eggs are disposed of within a short period.

The larva. The larvae are shining, dirty, greenish white in color while feeding upon the interior seed mass. Larvae that have matured within the ripened fruit, and that have penetrated into the meat, are the same rich golden yellow color as the ripe fruit.

Habits of the larvae. The larvae of the papaw fruit fly occur in the interior of the fruit, first feeding in the central seed mass, but later, as they mature and the fruit ripens, working into the meat and ruining the fruit. The number of larvae in a single fruit varies from two or three to twenty or more. Sometimes larvae of different sizes occur in the same fruit at the same time, showing that the infestation was from more than one oviposition.

Cultivated fruit has been found to be generally less infested than that growing wild, and this is ascribed to the fact that the flesh of the cultivated fruits is usually thicker, the thin-fleshed varieties appearing to be more generally attacked. It seems that the eggs are deposited inside the seed cavity, or at least the insects develop best when this happens. Thick-fleshed fruit often

showed numerous scars, indicating attempts at oviposition, when no injury to the seed mass or the flesh occurred to indicate the feeding of the larvae. On the other hand, fruits were noticed, in which fully grown larvae were found dead. This is explained as being the result of an attack on fruits which were too young. The contact with the juice of the unripe fruit is quickly fatal to the larvae. It is evident that the fruit was too young when attacked, and that the maggots became fully grown and attempted to penetrate into the flesh before it was sufficiently ripened, and they were killed by contact with the juice. In the ripe fruit the flesh is softer, and the gummy juice is no longer exuded.

Pupal period. The larvae when full-grown usually leave the fruit and fall to the ground, where they pupate, under some bit of rock or buried in the soil at a depth of one or two inches.

The length of the pupal period is given as seventeen to twenty-one days in Porto Rico, and from thirty to forty-two days in Florida. The latter figures were obtained as the result of observations in the cool season of the year.

Habits of the adult and oviposition. The adults of this species appear only for a short time just before sunset. A female fly was observed to alight on a well developed but unripe fruit. After walking about a little she inserted the ovipositor its full length into the fruit. As soon as the rind was punctured, the milky juice which the unripe fruit exudes whenever injured welled forth and began to trickle down over the surface. It is evident that the female fly endeavors to thrust her ovipositor through the flesh to deposit the eggs in the central seed cavity, and that it is only in those varieties with the thinner-fleshed fruit that this is successfully accomplished. The larvae are always found in the seed mass, except when they are full-grown and the fruit is ripe, when they penetrate into the flesh with the object of working their way to the outside in order to get to the ground and pupate.

Food plants. Up to the present time no other fruit than the papaw has been recorded as being attacked by this insect, and all attempts to introduce the larvae to feed on other fruits have, so far, failed.

Rapid increase of the fruit fly. During the last two years the papaw fruit fly has rapidly increased in abundance, and has extended its range so as to threaten seriously the future development of the papaw industry in Florida. This is largely a result of the increased cultivation of the papaw in the southern part of the State. Some varieties of Philippine stock producing large fruits are apparently free from attack.

Control. It has been pointed out that fruit with very thick meat escapes infestation. While the papaw fruit fly attempts to oviposit on such fruit, the thickness of the meat prevents the tip of the ovipositor from reaching the seed cavity, and in the meat itself the larvae cannot live. It was further found that in some

fruits the larvae had reached maturity before these had ripened, and had been killed by the sticky juice of the green fruit in endeavoring to escape. The means of control that now seem valuable are the production of varieties of papaw that have thick meat and that ripen slowly, and the conscientious destruction of adventitious or wild papaw plants, and of all infested fruits. All plants with inferior fruit should be eliminated. H. A. R.

THE PRODUCTION OF THYMOL.

In the issue for January 13, 1915, the Times calls attention to the fact that hitherto the well-known antiseptic thymol has been manufactured in Germany, notwithstanding the fact that ajowan seeds, the sole source of commercial thymol, are grown in India.

The plant which produces ajowan seeds belongs to the natural order umbelliferae, and is known as *Carum copticum*. The plant is cultivated from Bengal and the Punjab to the South Deccan. It appears that two products are obtained from the seed, but the 'Ornum water,' which contains the thymol, is the more important.

Thymol is a better antiseptic than phenol (carbolic acid), being less irritant in its action on wounds. Thymol is also a useful medicine for the expulsion of intestinal parasites, being largely employed in cases of ankylostomiasis.

Perhaps ajowan seed might be profitably cultivated as a minor industry in the West Indies; though, of course, the point in question at present is not one of production, but one of manufacture. —*Agricultural News*.

EFFECT OF THE TROPICS ON THE BLOOD.

The question of the influence of a tropical climate upon the blood of children of European descent is dealt with in the Annals of Tropical Medicine and Parasitology (December 15, 1914), in a paper by A. Breinl and H. Priestley, of the Australian Institute of Tropical Medicine. The investigation on which the paper is based was carried out in Queensland, and some very interesting results, possibly applicable in the West Indies, were obtained. It is worthy of note that previous investigations on the same subject have led to more or less contradictory results, but the present conclusions, being based on a large number of observations, may be considered as fairly well established.

The conclusions are as follows: Careful blood examinations performed on 574 school children in Townsville, Queensland, of European descent, of ages between seven and fifteen years, of whom the majority had been born and had resided in Tropical Queensland during their whole life, indicated (1) that the average number of red blood corpuscles is not diminished when compared with analogous figures for children born and bred in a

temperate climate; (2) that the average haemoglobin content of the blood is normal; (3) that the number of leucocytes (white corpuscles), is slightly increased; (4) that the average blood pressure does not show any difference from that of normal children in temperate climes.—*Agricultural News*.

THE INDIAN OIL PRESSING INDUSTRY.

That the oil-seeds industry is one of the important industries of this country will be realized when it is seen that in the Bombay presidency (inclusive of Sind) alone there are nearly 4,000,000 acres—not 400,000 as mentioned in the government resolution on the reports—of these seeds under cultivation, and the value of the export trade in 1912 amounted to over 520 lakhs of rupees. The chief seeds from which oil is extracted in the country are the cotton-seed, ground-nut, castor-oil seed, rape-seed, linseed, poppy-seed, and mowra-seed. Linseed alone is exported from India to the value of over 420 lakhs in a year, while the value of mowraseed exports reaches 240 lakhs, castor oil-seed 123 lakhs, rape-seed 92 lakhs, ground-nuts 92 lakhs and cotton-seed 73 lakhs. The importance of the oil-seed industry to the country is thus apparent. But, as every one knows, instead of these seeds being pressed in this country and the oil exported to western countries, India has been exporting the raw material in large quantities, allowing the oil to be pressed and refined outside the country, thus losing a source of immense profit. The Bombay Presidency imported vegetable oils to the value of nearly six lakhs of rupees in 1912-13—oils which, if the necessary facilities had been forthcoming, could have been manufactured locally. The indigenous oil-pressing industry in this presidency is an old one, as everywhere else in India, and, though the methods may be crude, it plays an important part in the economy of the country. Mr. Pandit calculates the total daily output of the *ghanis*—the indigenous oil-pressing machinery—at 155 tons. He also thinks that the *teli*—the native oil man—will be able to hold his own for a long time to come, in spite of the introduction of power machinery from the west. Mr. Pandit, however, says that the economic condition of the workers is generally far from satisfactory, chiefly on account of the high prices ruling in the land.—*Indian Agriculturist*.

Do not waste feed on unprofitable stock. It is only when the returns show a profit over cost of production and keep that birds should be retained.

Cockerels to be fattened for the market should be fed well from the first, and confined in a small space. They will be profitable only when turned off in the shortest possible period.

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G. K. LARRISON,
Superintendent of Hydrography.

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EDW. M. EHRHORN,
Superintendent of Entomology.

THE HAWAIIAN FORESTER AGRICULTURIST

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COÖPERATION EXPOUNDED.

Coöperation among small farmers in Hawaii has for many years been advocated by the Forester. A movement has just been started for the coöperative marketing of fresh pineapples on the mainland, to relieve a condition of over-production in raising that fruit here for the canneries. Some shipments have gone forward in steamers within the past few weeks. For the benefit of Hawaiian homesteaders who may be considering further development of the coöperative idea here, in this number we begin reprinting a circular on the subject in general, issued by the college of agriculture of the University of California. It is by G. Harold Powell, general manager of the California Fruit Growers' Exchange; former assistant chief of the bureau of plant industry, and former pomologist in charge of fruit transportation and storage investigations, United States department of agriculture.

REGARDING PAPAIN.

Much attention is being given to the growing of the papaya and the manufacture of papain by the tropical press. There is an article of six pages, by H. F. Macmillan, on the dual subject in the March number of the Tropical Agriculturist of Ceylon, in which the interest lately shown in the question of making papain in Hawaii, evidenced by an experiment station pamphlet, is mentioned. Under the subhead, "Properties of Papain," the article says:

"The peptonizing or digestive power is well known, and it is considered a good substitute for animal pepsin, but, unlike the latter, it requires neither the aid of an acid nor an alkali to convert the contents of the stomach into a peptone. The celebrated chemist Vauquelin compared papain to 'blood deprived of its coloring matter.' The material has not, however, come into extensive use in medicine, its consumption at present being chiefly confined to America, where it is much used in the treatment of chronic dyspepsia, gastritis, diphtheria, etc., and it is also recommended for eczema. In Ceylon it is not used medicinally, except perhaps in native medicine. It is described, however, in Waring's

Indian Pharmacopœia and Dymock's *Materia Medica* of Western India. Papain has the effect of curdling milk, like rennet, and might be used as a substitute for the latter. The demand for papain is, of course, limited, and the present supply appears to come almost entirely from Ceylon and the West Indies, more especially the island of Montserrat."

It is stated that the United States is the largest consumer of the article, importing it annually to the value of more than \$75,000. The price paid in the States varies from \$1.50 to \$3 a pound, according to quality as tested to determine its digestive properties. Mr. Macmillan concludes his treatise as follows:

"Opinion among large consumers appears to be divided on the present question of the supply and demand, for while some state that the consumption of the drug is on the increase and the prospects are good for marketing larger quantities, others affirm that the only means of extending the market would be in the production of a more carefully-prepared product which would replace the cheaper and adulterated grades, of which considerable quantities are sold. In the course of an article on papain in the *Journal of the Royal Society of Arts* (September, 1913), the statement was made that

"The United States prefer the inferior qualities from the West Indies, and also desire a white or bleached papain, which the Ceylon natives are not always in a position to supply. Importers, however, could, without much difficulty, procure an almost unlimited supply of the best unadulterated Ceylon papain if they were willing to pay a slightly better price for it than for the West Indian product, and would accept it in its natural state."

"Dr. Huybertsz of Kandy, who has devoted some attention to the preparation of papain, states that 'European and American importers object to papain in its natural color, and insist that it be white, or at least light. This, he says, is a great mistake, as it can only be obtained by bleaching—a process which sacrifices therapeutic efficiency for pharmaceutical appearance. Genuine papain is slightly saltish and somewhat acid. It has a peculiar, unmistakable smell, and the 'feel' of granular papain should be crisp, like biscuit, and easily crushed between the fingers. When it is doughy or sticky it has been adulterated or badly prepared. It has also slight escharotic action, and collectors of the fresh juice frequently blister their fingers. When mixed with water it has a soapy feel.' Up to a comparatively few years ago the value of papain was little understood, and it was mostly used in making mucilaginous products and chewing-gums. Since then the United States, Germany and Great Britain have taken considerable quantities, and it enters into many preparations. Recently America has found a new use for the drug, but what this is has not yet transpired."

BULLETIN ON BABY BEEF.

The Nebraska Experiment Station issued Bulletin 143 on "Feeding Baby Beef" at the North Platte Substation. This bulletin gives the results of fattening five lots of calves on different forage and grain rations during the winter of 1911 and 1912 and a duplication of this test during the following winter.

The calves were spring calves put into the feed lots shortly after weaning in the fall and fed until after the middle of June. They were about fourteen months old when sold. The average weight on the market was about 850 pounds. The average selling price was \$68.45 per calf.

The rations fed were as follows:

Lot 1—Prairie hay, corn 9 parts, and cottonseed cake 1 part.

Lot 2—Alfalfa, prairie hay, and corn.

Lot 3—Alfalfa, silage, and corn.

Lot 4—Prairie hay, silage, and corn.

Lot 5—Prairie hay, silage, corn 9 parts, and cottonseed cake 1 part.

The net profit per calf including the profit on hogs fed with the lots was as follows:

Lot 1—Fed prairie hay, corn 90 per cent, and cottonseed cake 10 per cent. Profit per calf, \$17.05.

Lot 2—Fed prairie hay, alfalfa, and corn. Profit per calf, \$20.28.

Lot 3—Fed alfalfa, silage, and corn. Profit per calf, \$22.21.

Lot 4—Fed prairie hay, silage, and corn. Profit per calf, \$11.77.

Lot 5—Fed prairie hay, silage, corn 90 per cent, and cottonseed cake 10 per cent. Profit per calf, \$13.82.

The ration composed of alfalfa, silage and corn gave the fastest and cheapest gains and the most profit per calf. The ration of alfalfa, prairie hay and corn ranked second. The two rations containing alfalfa gave much better results than any ration not containing alfalfa.

Silage had a much higher value when fed with alfalfa than when fed in rations without alfalfa.

Cottonseed cake was profitable when fed in rations that did not contain alfalfa, but was not profitable when fed in rations with alfalfa.

One of the most striking evidences of agricultural advancement in the Philippines is the Philippine Agriculturist and Forester, a magazine published by the student body of the college of agriculture at Los Banos, Laguna. In one number is found a graduating thesis on the cultivated root-producing aroids, to which the native Hawaiian "staff of life" taro belongs—an article of fourteen pages of cyclopedic information, including many

recipes for cooking the tubers. The number following that just mentioned contains advice to coconut planters in connection with the crisis in the industry produced by the war. "During recent years," the article says, "with the great development in Europe of industries which required great quantities of coconut oil, the price at which copra was once produced at a moderate profit has doubled and the growers of coconuts have grown wealthy." It goes on to say that the countries that bought Philippine copra are at war and their industries prostrated, so that they cannot use copra and will not buy it at any price, and, even if the war should be short, it will be a long time before the buying power of those old customers will be regained. In consequence, there will be a market for good copra and practically none for a poor article. The advice of the writer is to avoid cutting nuts off the trees, but instead let them drop off with sheer ripeness, as they will, thereby saving the expense of removing them artificially from the trees, as well as ensuring uniformly good copra. It is pointed out that good copra cannot be made from unripe nuts, and that good copra can be kept for a number of months without considerable deterioration.

*AN INTERESTING CAVE AT MAKAPUU HEADLAND,
OAHU.*

By VAUGHAN MACCAUGHEY, College of Hawaii.
(With Chemical Analyses by FRANK T. DILLINGHAM.)

Four Illustrations.

The Makapuu region is the extreme eastern portion of Oahu. It is well known by the great flashing light and lighthouse that stands high upon its barren cliffs. This arid headland is 642 feet high and marks the eastern terminus of the deeply-eroded Koolau Range. The wind-swept precipices are cut sheer through the innumerable superimposed lava-sheets that constitute the body of the original great Koolau dome. The vertical profiles of these ancient basalt streams are strikingly revealed (Fig. 1). Vegetation is exceedingly sparse and scattered; *Schiedea globosa* Mann, *Euphorbia cordata* Meyen, *Lepidium Oahuense* Ch. & Schl., and *Lipochaeta integrifolia* Gray, are representative plants. Well above high tide mark there is a broad wave-cut platform or shelf, varying in width from ten to sixty feet (Fig. 1). It is possible to walk along this platform, with the heavy surf on one hand and on the other the beetling naked cliffs.

While engaged in a three-day visit to this interesting region, during February of 1915, our attention was called, by Mr. Beasley, the lighthouse-keeper, to a remarkable cave near the



FIG. 1. Makapuu Headland coast, showing cliffs, platform and surf. Note the dip of the lava sheets; the absence of vegetation; the wave erosion.

sea. There are numerous caves in these Makapuu cliffs, some at sea level, and others at higher elevations, but this particular cave is quite separate from the others, both in location and in characteristics. We made a somewhat careful examination of this cave, collected a considerable number of specimens, and took a series of photographs, several of which are reproduced herewith.

The cave is situated in the east face of the Makapuu Point

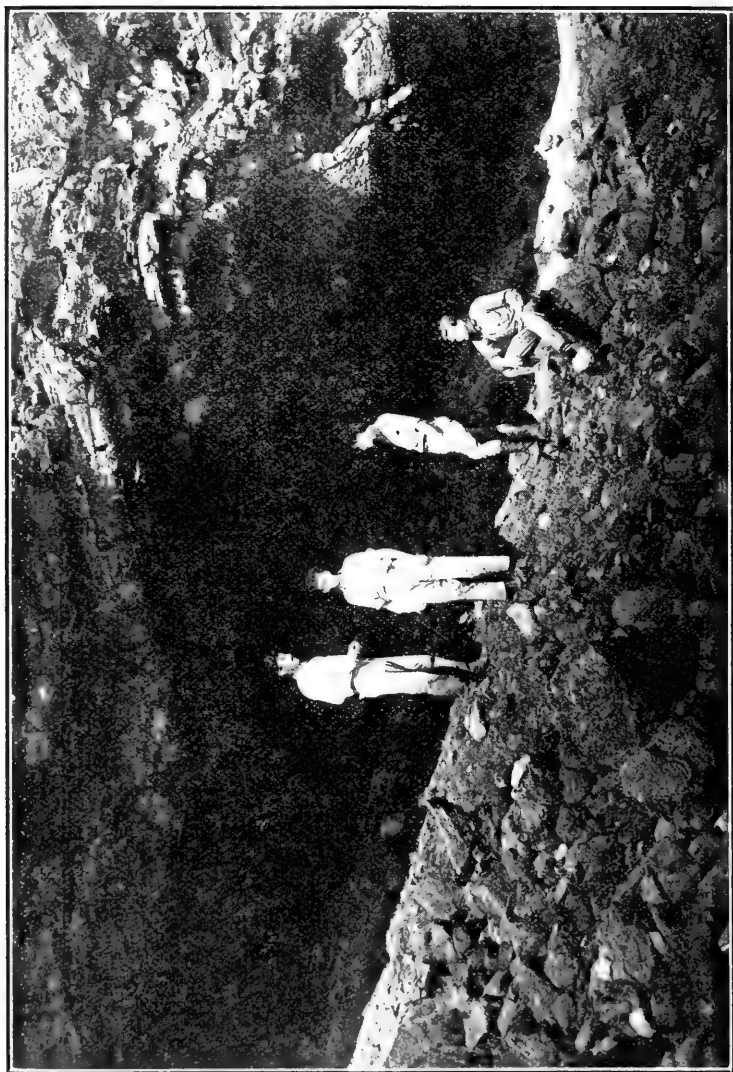


FIG. 2. The mouth of the cave. Note talus slope; basalt ceiling, and powder deposit on floor.

cliff. It is about 80 feet above sea level, and some 400 feet below the crest of the cliffs that rise directly above it. An extensive talus deposit slopes from the mouth of the cave down to the rocky platform already described. This deposit is composed of large sharp-edged blocks of basalt that have dropped from the cliff, mingled with fine detritus (Fig. 2). The mouth of the cave, shown in the figure, is about 50 feet long by 12 feet high. The cave is lenticular in profile, the basalt ceiling sloping gradually to the floor. The structure of the lava sheets that roof the



FIG. 3. Interior of the cave, showing floor and ceiling. The mouth of the cave is to the right.

cave has been exposed by vertical erosion to easy examination. These sheets vary in color, black, brown and gray predominating, with an occasional stratum of bright brick red. The flows also vary considerably in texture and in extent of disintegration.

The interior of the cave is shown in Fig. 3. The floor is deeply covered with a very fine-grained brown powder or dust. Here and there is a block of lava that has evidently dropped from the ceiling. The powder is very light in weight, and some-

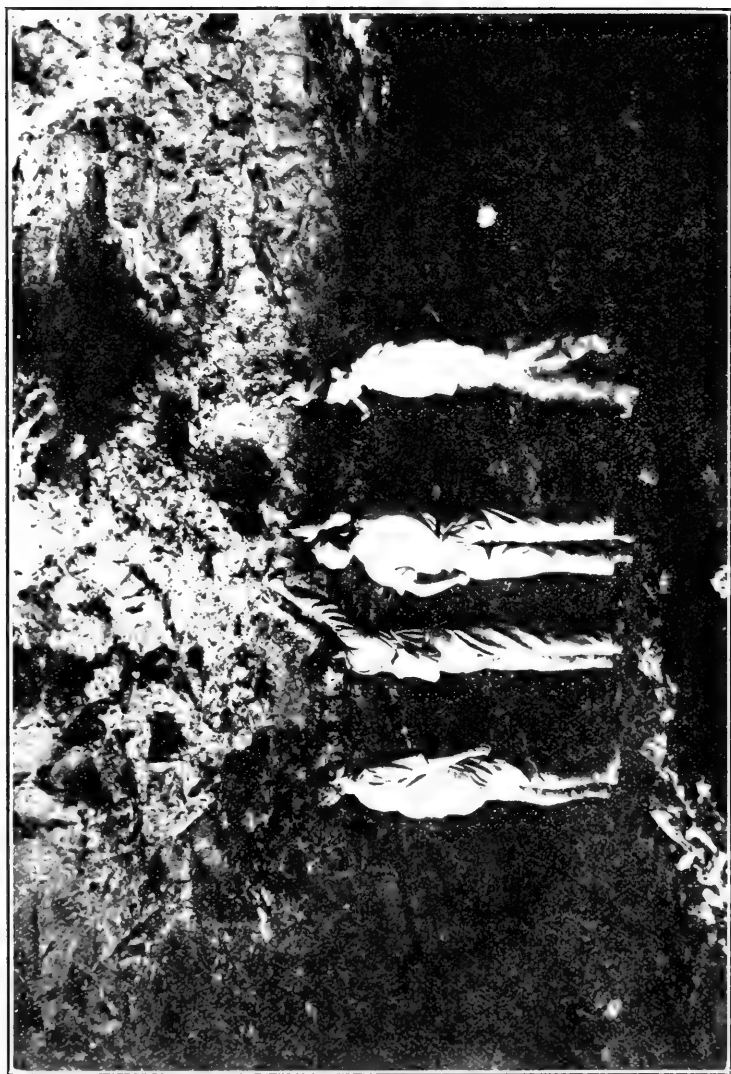


FIG. 4. Interior of the cave; collecting crystals.

what adhesive (as though not entirely dry). It covers the floor to a depth of from one to six inches, and is evidently the result of protracted deposition. Our first thought, upon examining this material, was of guano, but a further examination of the cave gave no evidence that it was now or ever had been used as a sea-bird habitat. There were no traces of nests, roosting places, or the other customary evidences of a guano cave.

The irregular ceiling proved to be almost entirely covered with a crystalline layer that was obviously still in process of forma-

tion. This layer varied in color from snow white to rich iron-sulphate green; in texture from very fine-grained "rice paper" texture up to flat knife-edged crystals several millimeters broad; and in thickness from thin bubbles that shattered at the merest breath, to stout crystalline stalactites the size of one's thumb. It required close inspection to make out the full beauty and delicacy of this "living" ceiling (Fig. 4). All of this crystalline material was quite moist with the water of percolation. It undoubtedly has been formed wholly through the seepage of surface water down through the lava sheets, and ultimate deposition on the ceiling of this cave. The extensive ceiling deposit thus gave us the clue to the impalpable powder that covers the floor; for the latter is evidently the *fragmenta*, accumulating through long periods of time, from the crystalline growth above it.

Professor Frank T. Dillingham of the College of Hawaii kindly made a chemical examination of this material, and reported as follows:

The deposits found as stalactites or coatings on the roof of the caves proved to be composed almost entirely of *gypsum*. There were also found to be present small quantities of iron, magnesium, silica, phosphoric acid and organic matter.

These deposits proved to be almost entirely soluble in hydrochloric acid.

The deposit found on the floor of the caves was light brown in color, and dry and powdery in consistency. Crystals of gypsum could be detected in it.

This deposit was found to contain considerable gypsum, and small amounts of iron, magnesium, phosphoric acid and organic matter. It appears to differ from the first mentioned deposits chiefly in containing a large quantity of matter insoluble in hydrochloric acid.

Apparently this deposit is derived from material brought down from the roof by disintegration or by percolation and subsequent evaporation.

Statement of results of analysis of the floor deposit:

1. Moisture	11.06%
2. Insoluble residue	48.35
3. Gypsum	21.40
4. Combined iron and aluminum as oxides (Fe_2O_3 Al_2O_3)	8.80
5. Total phosphoric acid (P_2O_5)	0.51
6. Undetermined (organic matter, magnesium, and silica)	9.88
	<hr/>
	100.00%
7. Total nitrogen .....	.12

FUNDAMENTAL PRINCIPLES OF CO-OPERATION IN AGRICULTURE.

By G. HAROLD POWELL.

(Circular of College of Agriculture, University of California.)

The coöperative organization differs fundamentally from the capital stock corporation conducted for profit. A capital stock corporation for profit is organized to return an earning and a profit on the capital used in the business. The basis of administration, control and the distribution of earnings is the capital invested in the undertaking. In a coöperative organization, the basis of control is the membership, where each votes equally irrespective of the volume of his business; though the basis of control is often made the product of the members, where each votes in proportion to the volume of business contributed, while the earnings in either case, if they occur, are returned to the member in proportion to the volume of business he transacts through the organization. The basis of the coöperative organization is men; of the capital stock corporation, money. Capital cannot coöperate; products cannot coöperate; only men can coöperate. When the degree of coöperation of a member is measured by the capital or the volume of business contributed, then the members as men are not coöperating; either capital or a product is the basis of coöperation through the member as the medium.

CONFUSION IN THE USE OF THE TERM "COÖPERATION."

There is much confusion in the use of the term "coöperation" as applied to agricultural efforts. It is commonly applied to any group of farmers who associate themselves together. They may organize as members of a voluntary unincorporated association of individuals; or as an incorporated capital stock association to handle farm crops for profit or for other purposes, or as non-profit corporations without capital stock. In California, for example, the term is applied to both profit and non-profit corporations organized to handle farm products, whether organized and controlled by the producers themselves, or by others. In other parts of the country, the same uncertain use of the term is applied to various kinds of agricultural movements. The term needs to be defined by the federal and state statutes. It is believed that its use as applied to business organizations in agriculture should be restricted to incorporated associations, societies, exchanges, or agencies which are formed exclusively for the benefit of the members; whose voting power is based on equality of membership; whose membership is confined exclusively to

active producers, the membership ceasing to exist when the producer withdraws from the organization, and whose earnings are distributed on the basis of the product, rather than on the capital contributed by each member, after a fair rate of interest is paid for the use of capital actually employed in the business, if any, and other overhead charges are deducted. A co-operative organization, therefore, is not a corporation in which the capital is contributed primarily in order that it may earn a profit; nor one composed of producers and non-producers; nor one in which the producer's product is handled by a corporation for the benefit of the stockholders rather than for that of the members; nor one in which the producer's product is handled by a corporation for the benefit of the stockholders rather than for that of the members; nor one in which the membership is not under the control of the organization; nor one in which the members do not actually control the organization. It is an association of farmers who unite in an effort to handle their common interests through an agency which is controlled by them, on the principle of an industrial democracy, and exclusively for their benefit.

FORMS OF COÖPERATIVE ASSOCIATIONS.

A coöperative association may be incorporated as a capital stock corporation or as a non-profit corporation without capital stock. If formed as a capital stock corporation it may still be legally coöperative if the laws under which it is formed permit the members to manage its affairs along coöperative lines, or if the statute provides the method of voting, the method of transferring stock, the limitation of membership and the distribution of earnings according to coöperative principles. There has been little effort by the states to enact laws that will permit the organization of purely coöperative associations of farmers. It is therefore impossible in most states for an association to be formed that can operate securely along coöperative principles, though as a matter of fact many associations so formed do, by the consent of the stockholders, actually operate coöperatively.

A STOCK CORPORATION NOT THE FORM FOR A COÖPERATIVE ORGANIZATION.

The stock corporation as defined by the statutes of most states is not the form under which to incorporate a farmers' business organization, though most of the so-called coöperative associations have been incorporated under the stock corporation statutes. The stock corporation laws have been enacted primarily to meet the needs of capital, not primarily for the benefit of those who may use the facilities of the corporation. The membership in such organizations is not under legal control, because the right to sell the stock is a legal incident of its

ownership. A stockholder may sell his farm and continue to be a stockholder in a stock corporation and still have the right to examine the affairs of the association, or he may sell his stock to some one who is not interested in the organization, or who may even be antagonistic to it; or he may withdraw his membership and still remain a stockholder. There is no legal way by which the stock, and therefore the control of the corporation, can be confined to the membership after the stock has once been issued, unless the association is able to take over the stock and hold it as a trustee, until it can be re-sold to a member. Neither is the voting power of the stockholders under control in a stock corporation, because the voting power is generally proportional to the number of shares held by each stockholder.

As a matter of fact most of the so-called coöperative associations of the country have been incorporated as capital stock corporations in the absence of other statutes under which they could be incorporated and many of them operate by mutual agreement expressed in the articles of incorporation, or in the by-laws, on strictly coöperative principles: others vote in accordance with stock ownership, fix a maximum amount of stock to be owned by any member, and apportion the stock on the bearing acreage of the members, but make no profits on capital. These organizations usually provide that a withdrawing member shall offer his stock to the association before he can sell it outside, a provision that is useless if the association is not able to take it over.

They may provide also that all the earnings shall be returned to the members pro-rated on the business transacted by each after interest is paid on the capital invested and other overhead charges are deducted. The stockholders may vote equally by agreement and the capital invested may be paid only a fair rate of interest for its use. The difficulty in such organizations lies in the fact that some of the conditions to which they agree are not, in case of trouble, enforceable in the courts, and the organization ceases to be co-operative when the stockholders desire for any reason to exercise their legal privileges along noncoöperative lines.

As a result of organizing a so-called coöperative association under the usual stock corporation laws, many of these organizations often pass into the hands of non-producers or of rival interests, following the withdrawal of members through the sale of farms and the sale and transfer of stock; or a partial control may be held by dissatisfied stockholders who have withdrawn as members.

NON-PROFIT CORPORATIONS.

In other states, especially in California, the statute provides for the incorporation, organization, management and coöperation of agricultural, non-profit associations which do not have capital

stock and whose business is not carried on for profit. These associations issue certificates of membership to each member but the membership cannot be transferred or assigned to any other person, nor is the purchaser of a property of a member entitled to membership by virtue of such purchase. In such associations the basis of voting and the control of the membership is subject to rules made by the association. These associations may accumulate a capital with which to transact business though the capital is not in the form of a paid-in capital stock. It may be accumulated pro rata from the proceeds of the shipments of the members, or in any other way agreed to by the members.

In Nebraska coöperation has been defined and given a legal status. The law says, "for the purpose of this act, the words 'coöperative company, corporation, or association' are defined to mean a company, corporation or association which authorizes the distribution of its earnings in part or wholly, on the basis of, or in proportion to, the amount of property bought from or sold to members, or of labor performed, or other service rendered to the corporation." It differs from the general incorporation law of Nebraska by providing that every coöperative corporation has the power 'to regulate and limit the right of stockholders to transfer their stock; and to make by-laws for the management of its affairs; and to provide for the distribution of its earnings.'

In Wisconsin, a law was passed in 1911, Chapter 368, Laws of 1911, which provides for the formation of "a coöperative association, society, company or exchange, for the purpose of conducting agricultural, dairy, mercantile, mining, manufacturing or mechanical business on the coöperative plan." It "may buy, sell, and deal in the product of any other coöperative company heretofore organized or hereafter organized" as a coöperative association. The law provides that "no stockholder in any such association shall own shares of a greater par value than one thousand dollars . . . or be entitled to more than one vote." It provides that the directors shall apportion the earnings, subject to revision by the association at any time, "by first paying dividends on the paid-up capital stock not exceeding six per centum per annum, then setting aside not less than ten per centum of the net profits for a reserve fund until an amount has been accumulated in said reserve fund equal to thirty per centum of the paid-up capital stock, and five per cent thereafter for an educational fund to be used in teaching coöperation, and the remainder of said net profits by uniform dividend upon the amount of purchase of shareholders and upon the wages and salaries of employees, and one-half of such uniform dividend to non-shareholders on the amount of their purchases, which may be credited to the account of such non-shareholders on account of capital stock of the association; but in productive associations such as creameries, canneries, elevators, factories, and the like, dividends shall be on raw material delivered instead of on goods purchased. In case

the association is both a selling and a producing concern, the dividends may be on both raw material delivered and on goods purchased by the patrons." The law provides that no corporation or association doing business for profit shall be entitled to the use of the term "coöperative" as part of its corporate or business name unless it has complied with the provisions of the act.

FURTHER DIFFICULTIES IN THE STOCK CORPORATION FORM OF ORGANIZATION.

One of the common difficulties in a so-called coöperative association formed as a stock corporation results from the payment of dividends on the paid-in capital above a fair interest for the use of the capital, especially where the capital contributed by the members is not proportional to their individual shipments. The tendency in such organizations is to pay high dividends on the stock. The stockholders generally demand an unusual earning on the capital contributed. They acquire the dividend habit. They deduct an amount from the proceeds from the product of all members, or from the earnings of the company, to pay the dividend, before returning the proceeds to the growers. In some fruit growers' organizations, dividends of 20, 30, or even 50 per cent have been paid on the capital stock.

The difficulty over the payment of dividends usually arises with a member who is a small stockholder and at the same time a large shipper, or when a stockholder ceases to be an important shipper. A grower becomes dissatisfied when he realizes that the payment of a profit to capital, whether taken from the proceeds of his fruit, or made as an earning on his purchases, are used to enrich a stockholder who has money invested in the corporation but who has not contributed to its success except in the original investment. Another source of trouble in the stock corporation is that the grower becomes dissatisfied after receiving a liberal dividend on his stock, if the business condition of the organization does not warrant its continued payment. In the citrus industry these difficulties have usually been avoided by paying no dividends on the capital, or at least a dividend not in excess of the customary rate of interest.

A farmers' organization that has been organized under the usual stock corporation laws, is on an uncertain foundation, not alone from the lack of control of the membership, but also because of the conflict between the capital and the product of the members whenever the proceeds derived from the latter are reduced to pay an unusual rate of interest on the capital contributed.

There are many so-called coöperative organizations (shrewdly formed) that make an earning for the corporation on the product of the grower by retaining the control of the facilities through which the growers' fruit is handled. The packing houses may be controlled by the organizers and a large dividend paid out of the

proceeds of the product on the capital invested. The purchase of supplies may contribute a profit, low grade supplies may be sold at the price of high grade material, and profits may be made in many other indirect ways. An organization that pays a profit to capital from the growers' product, either for the use of packing facilities or for any other service, is not coöperative. It is a stock corporation, operating for the grower for profit on capital, while a coöperative organization is operated by the producers wholly for their own benefit, the benefits being pro rated on the use which the members make of the organization.

A COÖPERATIVE ORGANIZATION MUST SPRING FROM NECESSITY.

A coöperative organization of farmers must be founded on economic necessity if it is to be permanently successful. The reason for its existence must lie in some vital service which it is expected to perform if it is to have strength enough to live in the face of the competition to which it will be instantly subjected. It must compete with existing organizations and this competition will be directed towards eliminating it; it will be viciously attacked; every conceivable form of misrepresentation will be levelled against it; the officers will be attacked by insidious rumors concerning their ability or integrity; the banks, especially in the newer sections, may be controlled by competitors, and may refuse to furnish the necessary credit; and every weapon known to competition, either legitimate or disreputable, will be used to put it out of business.

The average producer is not a business man, nor is he skilled in the arts of competitive business. He is naturally a strong individualist. He is slow to delegate authority over his affairs to any one and when he is face to face with the skilful arguments of those who aim to break the organization and keep him working as an individual, he is likely to weaken and finally leave the organization unless he had felt the effect of hard times, a helplessness arising from a combination of those who buy or sell his products, excessive freight, or commission charges, or other forms of oppression. It is an historical fact that the investment of the farmer must have been threatened by existing conditions before he has been able, in the past, to overcome his individualism sufficiently to work with his neighbors in coöperative work. The country is strewn with the wrecks of coöperative organizations that were born prematurely and which died by the wayside, because the farmer himself deserted in the first real conflict with the established agencies that have handled his business. Coöperation, to be successful, must be founded not only on economic necessity, but it must grow through gradual evolution. It must have a small beginning and grow in strength through experience step by step, rather than by leaps and bounds. The fundamental mistake that is being made in many localities is to form a farmers'

organization all at once on the plan of an organization that has taken years to develop. The plan may be sound but a coöperative organization can only succeed when given the unflinching support of the members who through years of experience have acquired an appreciation of the fundamentals that underlie a successful association of this kind. The success of any organization depends on its members, not on its form.

THE MEMBERSHIP IN A COÖPERATIVE ORGANIZATION.

The membership in a coöperative organization should be confined exclusively to those who are producers and who, as producers, use its facilities. The members should be acquainted and have confidence in each other. It should never include those who contribute capital alone to it. Many organizations are formed by bankers, fruit dealers, or others who promote an organization for the purpose of making a profit from it. They may be formed in good faith by business men who realize the value of the coöperative movement and who are willing, as a service, and not for profit, to furnish the capital for its organization. The need for such an organization must spring from within, from the necessity of the industry, and not from a desire of a commission merchant, a broker, or of an ambitious manager who sees an opportunity of capitalizing the coöperative movement for his personal benefit. There are many organizations of the latter type that masquerade under the coöperative banner, but which are formed, managed, and controlled either directly or indirectly by those who make a profit on the packing organizations, on the sale of fruit, on the purchase of supplies, on railroad claims or trade rebates, or in other indirect ways. Such organizations are always kept prominently before the growers as coöperative, a situation which, when it exists, is almost *prima facie* evidence that the coöperative features are for the benefit of a few, rather than for all the members.

Membership in a coöperative organization should carry with it a responsibility on the part of the member strong enough to carry it through adversity of every kind. To feel this responsibility, the member must of course feel the necessity for the organization; he must feel that he is a part of it; that the organization is his, developed and managed to promote and protect his interests. If the association is formed by the members to meet their economic needs, this feeling of responsibility pervades the membership, but if the association is formed to promote the welfare of the officers or any other class of people, or if financed by well meaning people who really desire its success, an association cannot depend on the loyalty of its members in time of adversity.

One of the problems that a coöperative association always has before it is keeping alive the interest of its members. They must

be a vital part of the organization. They must take an active part in its development. They must keep posted on the details of the business; the business methods of the organization must be an open book to them. There can be nothing mysterious about the management of the business. Contracts, salaries, trade or other legitimate rebates, railroad claims, profits, or earnings of every kind—these must be of such a nature that every producer can know about them if a coöperative association is to maintain the loyal support and confidence of its members. It must, of course, win that support by the results it accomplishes and these results must be obtained by a business record that keeps free from suspicion regarding the integrity of its methods, and as free as possible from criticism regarding its business efficiency. Every defect of the organization will be kept before the members by its competitors, and imaginary defects created by willful misrepresentation by those who aim to break down the membership, will always be prominently featured.

VOTING POWER OF MEMBERS.

In a strictly coöperative organization a fundamental principle should be "one man, one vote." It should be a real industrial democracy in which the members trust each other and lean upon each other's judgment as men. In such an organization neither the capital contributed nor the volume of business transacted should be the basis of the responsibility or influence of the individual member, because neither can coöperate or be made a basis for lasting coöperation. In the European coöperative associations the "one man, one vote" principle is applied as a test to separate the true coöperative associations from the pseudo coöperative. Since coöperation is founded on man, not on capital nor on products, there is no fundamental difference in principle where capital is eliminated and product is substituted as the basis of voting and control. The control of a coöperative association should be founded on the equality of membership, whether the member contributes a large or a small volume of business. It is the members who, as men, coöperate in these organizations. The history of the coöperative movement in Europe and in California shows that this fundamental basis is sound. In the latter state, one organization, the California Fruit Growers Exchange, which was formed as a stock corporation, but which operates strictly on coöperative principles, handles a business of twenty million dollars, more or less, annually on the "one man, one vote" principle of voting. The directors each represent a business that varies widely in volume and in value, but the "one man, one vote" principle of representation has stood the test of business experience and has been one of the foundation stones on which the success of this organization has been built. The directors reserved the right when they organized to vote pro rata on the shipments rep-

resented by them, but this method of voting has never been used in twenty years of business experience. The California statute governing the non-profit corporations without capital stock permits the voting power of members to be equal or unequal. In many of these organizations the voting power and property rights of the members is proportional to the contribution which each makes to the investment necessary for operation, the by-laws in some citrus fruit organizations providing that "members will contribute to the investment necessary for operation in true proportion to the number of bearing acres of citrus orchard owned or controlled by each member respectively bears to the whole number of bearing acres for which citrus fruits are delivered or engaged to be delivered to the association any time during the year such memberships are issued." Even with such a provision in the by-laws, the "one man, one vote" principle is generally used in voting on the business operations of the organization.

There is a strong sentiment against the "one man, one vote" principle of voting when first presented to the average producer. The large producer fears control by smaller interests; the small land holders, domination by their larger neighbors. The history of the coöperative movement, both in Europe and in the United States shows clearly that this adverse sentiment is a prejudice rather than an actual weakness in practical operation. Equality of membership strengthens the desire to coöperate, and men work together in business harmony just as they now do in the equal control of churches, schools and in governmental responsibilities.

(To be concluded.)

FRENCH FORESTS IN THE WAR ZONE.

By SAMUEL T. DANA.

(Reprinted from American Forestry.)

When the history of the present European war comes to be written, it will probably be found that the forests of the regions involved have played a much more important part than is suspected by the ordinary reader. A hint of this is contained in a German news despatch of October 14, which read: "Heavy fighting continues in the Argonnes. Our troops are moving through dense underwood in very difficult ground with siege trains for use against the fortifications. The French troops offer obstinate resistance, firing from trees where machine guns are posted."

It is stated that this same forest of Argonne, which has been the scene of such vigorous and continued fighting during the present war, enabled the French to repulse the Prussian attack

of 1792 and, nearly eighty years later, in 1870, at the time of the Franco-Prussian war, concealed the maneuvers of the Germans before their crushing defeat of the French in the battle of Sedan. To the westward the forest of Orleans is said to have given the French the opportunity of rallying for their final stand in 1871; while to the eastward the forest of Soignes, by the shelter which it offered to Wellington's forces, contributed to the defeat of Napoleon at Waterloo.

That the French government itself recognizes the forests as a means of defense is shown by a provision in the Code Forestier, adopted in 1829 and still the forest law of the land, that private owners can be prevented by the government from clearing away forests at the frontier wherever these are deemed necessary for defensive purposes. There can be no question that they are in fact a decided advantage to the army having possession of them. First of all they offer a serious obstacle to the advance of the enemy. Troops cannot march nor can artillery trains be transported rapidly through dense woods, particularly when it is possible to block the few roads leading through them by fallen trees. In Alsace, so I was informed by an eye-witness, the first step taken by the Germans after the declaration of war was to barricade every road as effectively as possible in this way. Presumably the French did the same thing in their own country wherever they were forced to retreat. That the blockades established in this way were effective in checking the advance and wasting the strength of the enemy can hardly be questioned.

Furthermore, the forest forms an excellent shelter from which an army can fire upon an advancing enemy, while itself remaining in comparative security. It is easy to imagine an infantry or a cavalry charge across an open plain against an opposing army entrenched on the edge of a forest being repulsed with tremendous loss. On the other hand, there would be situations, particularly in level country, where the forest would present a serious obstacle to artillery fire, and considerable areas have probably already been cut over, in this as in other wars, to afford a clearer field and wider range for the batteries.

The value of a wooded cover in making fortifications must also not be overlooked. A correspondent with the German army in describing the fortifications about Metz has stated that they were so skilfully concealed by woods and blended with the hill-sides that nothing out of the ordinary was apparent. This is in striking contrast to the forts at Liège, which, being unprotected in this way, stood out so boldly against the sky line as fairly to invite bombardment. The correspondent further stated that in one particular battery which he visited overlooking the River Meuse, the guns were placed behind a screen of thickly-branching trees with the muzzles pointing to round openings in this leafy roof. Even the gun carriages and tents were screened with branches, while a hedge of boughs was constructed around the

entire position as a protection against spies. This battery had been firing for four days from the same position without being discovered, although French aviators had located all of its sister batteries so accurately that they had suffered considerable loss from shrapnel fire.

The present war is, of course, the first in which the forests have exercised this important function of concealing the positions and numbers of the various armies from the vigilance of the enemy's airmen. In open country nothing is more simple than for an aviator to determine with considerable accuracy the strength, position, and movements of the enemy's forces. In a forest this is impossible, and to the concealment which it affords can probably be attributed mainly what few surprises the strategists of the contending countries have been able to bring about in spite of aviators and spies. To the latter the forest offers an excellent opportunity for effective scouting. Natives of the country, thoroughly familiar with local conditions, find it comparatively easy to steal by outposts and to observe the enemy without being detected.

In the war zone of Northeastern France conditions as regard forest cover vary widely. In the roughly rectangular area to the northeast of the Seine and northwest of the Oise, the country is for the most part very flat, and is almost wholly given up to agriculture. To the south of the Oise and the Aisne, it becomes more undulating, with low hills, and here the farming land is interspersed with patches of forest and woodland. Still farther to the south and east along the Meuse river and in the Vosges mountains, the country becomes still more rugged and the forests more abundant.

The topography and the distribution of the forests throughout this region probably account largely for the decision of the Germans to hurl their main attack against France through Belgium rather than through the more difficult route to the south. To these factors can also be attributed in large measure the rapid advance of the right wing of the German army in the early stages of the war, while the left made little or no progress. In the north the comparatively level, unwooded country interposed practically no obstacle to the free movement of the armies, and as a result the early advance of the Germans here was almost incredibly swift. During the same period, farther to the south in the region of Verdun and Nancy, the rugged, heavily wooded country, in conjunction with fortifications and strongly entrenched troops, held both armies practically stationary.

To what extent the forests in the war zone will be injured during the progress of the war is problematical. That they will suffer more or less, however, cannot be doubted. Much wood will be cut for fuel and construction work; trees will be felled to block roads; whole stands may be leveled to clear the way for artillery fire; and the rain of shot and shell will do much damage

to standing trees, much more than the damage done similar forests in the Franco-Prussian war. Equally serious will be the havoc wrought by forest fires. These will be set not only by accident, but also purposely in order to harass the enemy. This was the case in the forest of Compiègne, which is said to have been fired by the British in order to drive out the Germans. While the fire may have been effective from this point of view, it also doubtless destroyed very largely the natural beauty of the famous forest and seriously disarranged the carefully laid plans for its management. If the war lasts as long as experts predict, it is certain that large sections of the forests in which the armies will operate will be cut down for firewood. To date it is evident that there has been much cutting of young growth to use as screens in hiding entrenchments and masking batteries. Cathedrals and other edifices are not the only objects that have been devastated. Like the cities and towns, the forests will for many years bear unmistakable evidence of the ravages of war, and in many cases the damage done them will take much longer to repair.

MANURING FRUIT TREES.

For maintaining fruit trees in bearing, in health and vigor, and enabling them to bear heavy crops of fruit, it is essential that they be properly nourished.

In practice, this is generally ensured by application of fertilizers.

In order to better understand the subject, it is worth the fruit-grower's while to unearh this knowledge himself, in his own orchard.

There are three ingredients which need to be furnished through the medium of fertilizers—namely, potash, phosphoric acid, and nitrogen. The remaining essential plant food constituents are usually present in the soil in abundant quantity, and need not be supplied. Adverting to these three important constituents, it is generally safer, when the fruit-grower is not properly conversant with the tree's requirements on his particular land, to apply all three. A one-sided manuring is not a profitable manuring, and is not productive of the best results.

In order to ascertain the requirements of fruit trees in his orchard, the fruit-grower is recommended to experiment; in other words, manure certain rows of trees in the orchard with different manurial dressings and closely observe the results with regard to yield, size, color, appearance, flavor, and keeping qualities of the fruit produced, and also the appearance, vigor and disease-resistant properties of the trees, and, not the least important, the profits accruing from their application.

The beginner should remember that potassic fertilizers supply potash phosphatic fertilizers, phosphoric acid; and nitrogenous fertilizers, nitrogen respectively.

Examples of potash fertilizers are: Sulphate of potash and muriate of potash. Those of phosphatic fertilizers: Superphosphate, basic slag, and bonedust, the last named also supplying a little nitrogen, while sulphate of ammonia and nitrate of soda may be cited as examples of nitrogenous fertilizers.

Supposing a fruit-grower is desirous of ascertaining whether fruit trees on his land will respond to potash, all he need do is to apply phosphatic and nitrogenous fertilizer to a number of trees and make a note of it. Such a dressing is known as an incomplete fertilizer, as it does not supply all the three important plant food ingredients. To an equal number of trees of the same age, variety and size, on similar land, he should apply the same amounts of phosphatic and nitrogenous fertilizer, plus, say, 1 to 2 lb. sulphate of potash per tree.

Similarly, if a grower desires to find out if it will be profitable to apply phosphatic or nitrogenous fertilizer, he may proceed on similar lines, omitting the particular fertilizer which he needs the information about from the dressing, in one case, be it phosphatic or nitrogenous, and including it in another. In this way the fruit-grower may observe the behavior of the trees towards the particular kinds of fertilizers.

Fruit crops are unlike most farm crops, in that the effects of fertilizers are not so readily observable, and the beginner needs to be warned against expecting outstanding results the first season. The second and subsequent seasons, however, good results may follow rational manuring.

Mr. Alfred Thiessen of Geeveston, Tasmania, laid down experiments on the three-plot system in the spring of 1912 with apple trees. The trees on the No. 1 plot were left unmanured, those on No. 2 received 3 lb. superphosphate, 2 lb. bonedust, $\frac{1}{2}$ lb. sulphate of ammonia, $1\frac{1}{2}$ lb. sulphate of potash per tree, and those on No. 3 received 3 lb. superphosphate, 2 lb. bonedust, $\frac{1}{2}$ lb. sulphate of ammonia.

The yields, calculated per acre, for the first season were: Plot 1, 560 cases; Plot 2, 800 cases; Plot 3, 666 $\frac{2}{3}$ cases.

The past season's results (being the second year of experiment) were: Plot 1, 524 $\frac{1}{2}$ cases; Plot 2, 1022 $\frac{1}{4}$ cases; Plot 3, 915 cases.

The absence of fertilizer on Plot 1 accounted for considerably lower yields. The trees on Plots 2 and 3 each received the same amounts of superphosphate, bonedust and sulphate of ammonia. Those on Plot 2 were given $1\frac{1}{2}$ lb. sulphate of potash in addition.

The difference in yield, and consequently the money value, between the two plots was well marked, and showed that the complete fertilizer was the most profitable one.—*The Fruit World*.

PRUNING OF ORANGE TREES.

On no account plant below the level of surrounding surface, or so that the original ground level of tree will sink below that plane. It is very much preferable to err on the other side; the roots will extend downwards where necessary, but the base of stem is a fixture and will remain where placed unless forcibly moved. Nursery stock is not infrequently trained to a long bare stem terminating in a bunch of small branches. Such samples should be cut back to within 18 inches or less of the ground level—in fact, all trees other than those reared in pots should be well shortened at planting, four or five shoots which are to form the main branches being allowed to start at regular intervals. A little extra attention in the early stage and the first two years' growth will, by the removal of surplus and misplaced shoots, not only remove the necessity of later amputation of larger branches, but by directing the growth into permanent channels assist in the earlier development of the tree. No hard-and-fast rules can be followed for pruning young trees, but misplaced shoots should be removed in the earliest stages by a sharp knife and cut close to the base, thus removing any adventitious buds which the practice of rubbing off with finger and thumb allows to remain, to become a perpetual source of trouble and the formation of unsightly callus. The orange being exceedingly susceptible to injury by exposure of its roots, for this reason the handling of young trees must be such as to allow a minimum of exposure. They should not be allowed to become dry under any condition, and the application of water at planting should be as soon after insertion as possible.—*Queensland Agricultural Journal*.

FRUITING CAPACITY OF THE PAPAYA.

The question of the advantage derived from thinning out the ring of fruits on the papaya tree is discussed in an Indian article reproduced in the *Tropical Agriculturist* for January, 1915. An experiment was conducted at Poona with the fruit of twenty plants, ten of which were thinned and ten unthinned. The number of fruits obtained from the thinned was ten, whilst the unthinned gave twenty-four. Although the increase in weight of the individual fruit in the case of the thinned plants was very considerable, and although there was an accompanying rise in the price, the results showed that the increase of weight and value was not sufficient to compensate for the loss of fruits. This conclusion refers only to the particular experiment just described. The article goes on to say that with a small number of, say six, good fruits per plant the experiment may pay ultimately when carried out on a large scale as indicated in the Annual Report of the Government Horticultural Gardens, Lucknow, for 1912, where it is stated that an acre of land carrying 1000 plants, each

producing six to ten fruits after thinning, may give considerable profit to the grower. The difficulty is to hit on exactly the right amount of thinning to get the greatest weight compatible with the greatest number of fruits. This can only be obtained by practice, and in the meantime it is recommended to remove only such fruits as are obviously going to be badly crushed.—*Agricultural News*.

THE FARMER'S CREED.

I believe that the country which God made is more beautiful than the city which man made; that life out of doors and in touch with the earth is the natural life of man. I believe that work with nature is more inspiring than work with the most intricate machinery. I believe that the dignity of labor depends, not on what you do, but how you do it; that opportunity comes to a boy on the farm as often as to a boy in the city; that life is larger and freer and happier on the farm than in the town; that my success depends, not upon my dreams, but upon what I actually do; not upon luck, but upon pluck. I believe in working when you work, and in playing when you play, and in giving and demanding a square deal in every act of life. — Edwin Osgood Grover, in *Philippine Agriculturist and Forester*.

A PRAYER THAT NEVER GETS OLD.

Oh for a lodge in some vast wilderness,
Some boundless contiguity of shade,
Where rumor of oppression and deceit,
Of unsuccessful or successful war
Might never reach me more. My ear is pained,
My soul is sick with every day's report
Of wrong and outrage with which earth is filled.

WILLIAM COWPER.

In hot weather it is no indication that the fowls have had enough if they leave their food.

Neglecting to give fowls a regular supply of water is a serious matter. Dark combs are often an indication of neglect in this respect.

Sudden changes in the system of feeding are often responsible for vexation and loss. Any contemplated change should be made by degrees.

It is impossible to raise vigorous stock if these are not kept in the pink of condition. Protection from climatic extremes, absolute cleanliness, and a good supply of green feed are essentials to this end.—*Feathered Life*.

UTILIZATION OF SUN POWER.

An interesting paper was read at the International Congress of Tropical Agriculture on the utilization of sun power for irrigation and other purposes connected with agriculture in the tropics. The principle involved in these machines is the concentration of radiant energy by means of mirrors on to boilers enclosed in glass cases to check radiation.

Mr. F. Shuman stated that results of tests of the sun power plant near Cairo in Egypt had been satisfactory. It is estimated that power can be produced in the tropics at the same cost as if coal were less than 10s. per ton; and as coal in many parts of the tropics costs £2 10s. per ton, upwards, the saving to be effected by means of sun power plants is quite obvious. Though sun power plants cost more than coal-burning plants, the saving effected by not requiring any fuel is sufficient to wipe out the extra capital cost after two years, and in four years to pay entirely for the whole equipment.

Discontinuity in sunlight is overcome by the art of using low pressure steam: boiling water is stored in tanks and the steam drawn upon as required.—*Agricultural News*.

DROPPING OF BREADFRUIT.

We often have callers and letters asking why the young fruit drops from certain breadfruit (or other fruit) trees, so that none mature. This is usually because there is too much vegetative vigor in the trees—they run to leaf and twig, and this condition is usually caused by a too plentiful supply of water at the wrong time.

As a rule such trees are standing in yards where there is a water pipe, and the water is constantly soaking the roots, inducing fresh growth. When once the breadfruit tree blossoms freely, the water should only be allowed moderately when the soil is seen getting dry; and the fruit will thus hold.

Where the conditions of growth are not governed by a water pipe, and the fruit will not hold, the owner should try, as an experiment, girdling the tree with a wire drawn tight round the trunk, doing this just when the fruit is setting. It will generally be found that this will prevent the falling of the fruit. When the fruit is over half fit the wire can be taken off and the bark will heal over in three months.

This can be done with all fruit trees that drop their fruit just after setting, or when trees make plenty of leaf growth but do not fruit at all. Of course, dropping of fruit is not to be confounded with young fruits dropping because of the trees bearing

too large a crop; in this case there are always plenty left to mature. Our remarks apply when no fruit, or only a very few, remain on the tree, all the others dropping off before maturity.—*Jamaica Agricultural Society Journal.*

Charcoal is cheap enough, and is an excellent thing for poultry.

Irregular feeding is often the cause of many disorders in poultry.

The absence of green food means an undesirable pale color in the yolks of the eggs.

Laying hens should have all they can eat, and this should be of a high grade character.

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The records and maps of this division are available for inspection by any one who desires information relative to water resources, topography, etc. Blue print copies of hydrographic data relative to any stream, ditch, spring, etc., which may be under observation by this division will be mailed free of charge on request.

G. K. LARRISON,
Superintendent of Hydrography.

Vol. XII.

JULY, 1915

No. 7.

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DIVISION OF FORESTRY.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haugh, Forest Nurseryman, Box 207, Honolulu, Hawaii.

C. S. JUDD,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent of Entomology.

THE HAWAIIAN FORESTER AGRICULTURIST

VOL. XII.

JULY, 1915.

No. 7

Reports of the various divisions of the Board of Agriculture and Forestry for two months will be found in this number. They show in general effective work and progress by the chiefs and their assistants.

In its issue of June 5 the Agricultural News (West Indies) devotes a page to a review of the reports of the Hawaii Experiment Station for 1913 and 1914, to which it calls attention in its editorial notes, where also a recent article in the Forester, on pearl oyster culture, commenting upon one in the News itself, is mentioned.

It is clearly proved in the Journal of the Board of Agriculture for April, 1915, says the Agricultural News, that tubercular fowls may be a serious source of infection as regards pigs. On examining the organs of a total of 118 tubercular pigs, it appeared that eighty-six of them contained bacteria identical in every detail with tubercular bacteria, twenty-eight contained bovine bacteria, and in the remaining four cases the bacteria deviated in form from both types, but in two cases closely resembled the avian type. On the whole, the results of the investigation show that the overwhelming majority of the cases of mesenteric tuberculosis are of a local character, and almost exclusively due to avian tubercular bacteria.

Hawaiians on their travels this summer might do worse than take in Oklahoma state fair and exposition, at Oklahoma City from September 25 to October 2. Printed matter concerning it has been received, which indicates that this, one of the newest stars in the Union constellation, will shine brilliantly on the occasion.

The department of agriculture has issued a bulletin upon "Zygadenus or Death Camas," a plant which is found throughout the United States. In appearance it is grass-like, growing from a rootstock or bulb which looks like an onion; while the flowers are greenish white or yellow and somewhat resemble mignonette. In the Northwest the plant is known by numerous common names, such as lobelia, soap plant, alkali grass, water

lily, wild onion, hog's potato, squirrel food, poison sego, etc. No satisfactory or practical remedy for its effects upon stock has been found, although it is stated that animals becoming sick from eating it should be kept quiet, and that under this treatment many will recover.

DIVISION OF ANIMAL INDUSTRY.

REPORT FOR APRIL.

Honolulu, April 30, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I beg to submit herewith my report for the month of April, 1915:

BOVINE TUBERCULOSIS CONTROL WORK.

As will be seen from the appended report of Dr. Case's, the eradication of bovine tuberculosis which was begun five years ago this month, is rapidly approaching the desired goal. The question raised before the Agricultural Committee of the recent Legislative Assembly, as to whether it would be possible to completely eradicate bovine tuberculosis from this Territory, and whether, when once eradicated, it would be possible to prevent its reappearance seem to be definitely answered by the results before us here, as well as by the facts observed elsewhere, notably on the Island of Jersey, where bovine tuberculosis has never gained entrance. While it has required five years to reduce the number of dairy cattle affected with tuberculosis on the Island of Oahu from more than thirty per cent to less than two and one-tenth per cent, we feel justified in claiming that the remaining small number of affected animals can be located and disposed of, and the last trace of infection eradicated if the systematic work of testing is continued for another year. The work will be facilitated much if local sanitary authorities are willing to enforce their own statutes and adhere to the requirements of the ordinance which makes the issuing of a milk permit dependent upon the applicant's dairy herd having been tested and found free from bovine tuberculosis.

To abandon the work now would mean a speedy return to the conditions of five years ago, the time required to reach this condition depending entirely upon the measures taken by each individual dairy owner to protect his clean herd against the infection from his neighbor's diseased herd, unless it is decided by this Board to proceed against bovine tuberculosis as it has done against glanders among horses and mules, that is, deal with it

as an infectious and contagious disease transmissible to human beings and as such dangerous to public health. That this has not been done before was due to the great prevalence of the disease and the lack of funds wherewith to indemnify the owners of diseased cattle. It was therefore left to the dairymen gradually to clean their herds of infected animals and obtain remuneration for them through an increase in the price of milk. In this manner nearly ninety per cent of the milk producers on Oahu have gradually cleaned their herds, and there remains but a limited number who still harbor the infection and who seem to find it profitable to do so. When therefore a bill providing for the indemnification of the milk producers still having infected animals in their possession, was introduced before the last legislature it was actually defeated by these same dairymen for whose benefit it was promulgated.

Under these circumstances it would not seem necessary for this Board to be deterred any longer, as regards the complete eradication of the disease, at least if the statement on the basis of which the indemnification bill was defeated is proven correct, i.e., that ninety per cent of the local milk producers did not want any indemnification. It must also be borne in mind that the dairymen who have sacrificed varying numbers of their cattle in order to clean their herds and comply with the local regulations are entitled to protection against reinfection, or at least those who desire to continue to keep their herds clean, and if such protection should be required of this Board and the owner of a neighboring infected or untested herd should refuse to have his animals tested and the reactor destroyed it is well within the powers of this Board to place a rigid quarantine on the infected premises, which would mean the complete segregation of all the animals as well as their products, whether milk or manure.

Before resorting to such drastic measures, however, it is to be hoped that the recent opposition to this Board's tuberculosis control work will take the trouble to familiarize themselves with the various statutes and regulations now in force and pertaining to this subject, and will realize that the milk-consuming public will never agree to a return to milk from tuberculous cows for their children, regardless of the form in which it may be served. While pasteurized milk is safe enough, if properly pasteurized under official supervision, the best authorities agree that it is never safe to rely on pasteurization, and where there is so little infection left as is the case here, the only sane and safe way of dealing with it is by eradication.

THE HOG RAISING INDUSTRY.

While there is a certain mortality among the young pigs and especially among those only a few days old the same may be said

to be due principally to poor sanitary and hygienic conditions. In this connection it might be well to note what are the conditions along these lines in other places and what can be done to reduce this great mortality, the principal cause of which undoubtedly is to be found in faulty feeding, a lack of variety in the food offered, the use of too much swill and in some cases the almost complete absence of good pasturage and green feed of various kinds. The care of the sow at the time of farrowing also is of immense importance in saving a large percentage of the pigs born, and a lack of experience in dealing with both the mother and the young ones at this critical time is said to be enough to reduce the size of the litters by fifty per cent. The following is quoted from the Country Gentleman of May 15 of this year:

"We expect to lose some pigs, and if a sow crushes five or six in a night we call it hard luck. If she kills the whole litter we tag her for the butcher, and such is life on the hog farm. We do not realize that one-sixth of our pigs are gone. The truth is, we kill the young pigs by improper feeding of the sows or allow them to die as a result of our own carelessness.

"The precautions to be observed are simple: Handle your sows and accustom them to handling, but do not worry them at farrowing time. Be on hand when the litter arrives, and as each pig is born put it into a box that has been well bedded with straw so as to be warm and comfortable. When the sow settles down and is resting easily let the pigs nurse. Later if she becomes restless return them to the box. Be careful that you do not allow her to crush half the litter while you are at dinner or are doing chores at some other part of the farm.

"The first four or five days are the most critical for the young pigs, and a little time with them at that period pays big dividends later. Most breeders allow the sow only water for the twenty-four to forty-eight hours after farrowing. A few give one good feed to fill the sow up and keep her quiet. We prefer the first plan. Increase the amount of feed gradually and avoid any sudden changes in kind of feed supplied. Have the sleeping beds dry and fresh, keep the troughs clean, and see that all the pigs get plenty of exercise and sunlight.

"Two years ago an Iowa short-course instructor reported the following losses of young animals in that state:

"362 Iowa farmers lost 22.3 per cent of all colts foaled.

"469 Iowa farmers lost 8.4 per cent of all calves dropped.

"442 Iowa farmers lost 23.7 per cent of all pigs farrowed.

"Such loss and waste is too great a tax on the livestock industry. Buildings and equipment may be partly responsible, but improper feeding, carelessness and ignorance kill a large share of the young animals."

RABIES IN DOGS.

Another quotation relative to this Board's efforts at preventing the introduction of rabies or hydrophobia into the Territory with dogs coming from the mainland of the United States and from countries where this disease is known to exist would seem to be of sufficient interest to repeat here. It is taken from the May, 1915, issue of the Veterinary Record, London, England, and reads as follows:

"Most of us can remember the outcry that dog owners raised against the Board of Agriculture policy of quarantining imported dogs. The wisdom of that policy has been evident for a long time, and has recently been strikingly exemplified. We have just had the first case of canine rabies in the Kingdom since 1902; and it occurred in a dog in quarantine, and therefore unable to affect others. There is no gainsaying the moral of these two facts—the long immunity, and the one case occurring in the security of quarantine. Our present quarantine secures us from rabies. But if we relax it, the importation of dogs will greatly increase, and the prevalence of rabies in many other parts of the world would soon cause its re-introduction here."

Respectfully submitted,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT FOR MAY.

Honolulu, May 31, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I beg to report on the work of the Division of Animal Industry for the month ending May 31st as follows:

HOG CHOLERA.

On Saturday, May the 8th, this office was notified that a disease supposed to be hog cholera had appeared among the swine on the ranch belonging to Mr. Charles Bellina at Kuliouou, about eight miles from Honolulu on the road to Koko Head. The place was visited immediately and the diagnosis confirmed by post-mortem examination of a number of dead hogs. Vaccination with anti-hog cholera serum had already been begun, but as the disease appeared to be of a most unusually virulent nature and as the location was favorable for the purpose, it was recommended that the treatment of the hogs be placed in the hands of this Board, the

owner agreeing to abide by all instructions as to care, treatment and segregation, the Board furnishing the vaccine required.

On Monday, May 11th, while visiting the same place and while making a post-mortem examination of a recently dead hog, the writer was informed by Mr. P. Pond's ranch superintendent that a number of hogs had died at Mr. Pond's hog farm near Leilehua, showing the same symptoms, that is, ulcers in the intestines, as those exhibited in the hog then being examined. Consequently a visit was made to Mr. Pond's farm the following day, where it was learned that acute, virulent hog cholera had prevailed for ten or eleven days, making its first appearance on May 1st, or the day following my last visit to that place. No satisfactory reason for not notifying this office of the existing conditions could be obtained as little as Mr. Bellina could give any reason for his failure to report the outbreak on his place. It must therefore be considered a most remarkable coincidence that so virulent and fatal a disease should make its appearance simultaneously on two hog farms, forty miles apart, with no similar disease existing in the Territory and no hogs having been introduced from the mainland since March 15th, or nearly seven weeks before.

As already stated the serum treatment was undertaken immediately and with very good success in both of the infected herds. While a number of hogs were lost before the disease was under control the total loss aggregates but a fraction of what it would have been except for the serum treatment, and this fraction would undoubtedly have been still smaller had a sufficient quantity of serum been on hand to treat all the animals at once. The serum however is expensive, while its curative value diminishes with time; nor is it returnable to the manufacturers. For these reasons the local druggists cannot afford to keep it on hand in large quantities, but must rely on the cable for supplies beyond a reasonable amount, unless guaranteed by the hog owners.

The curative as well as preventive properties of this treatment are, however, well illustrated by the fact that at the present writing, that is seven to eight weeks after the first outbreak of the disease, all of the hogs which were injected before the disease had advanced beyond the fatal point and many of which were very sick at the time of treatment are now doing well and gaining flesh rapidly; still more remarkable, however, is the fact that the disease did not gain access to any other piggeries or hog farms, but was kept confined to the two original farms, which of course were declared in quarantine immediately after the diagnosis was made. But as both owners failed to report the appearance of the disease promptly there was every opportunity for the infection to become widespread before a quarantine was established, and what with dogs, horses, swill wagons, trucks and the shoes of laborers, drivers and visitors, it is as stated very remark-

able that the belated quarantine measures proved so effective. The continued drought with much sunshine and many warm days has undoubtedly assisted materially in destroying such infection as may have been carried away through carelessness or ignorance, while the treatment itself, aimed as it is at the destruction of the infection while still in the system of the affected animals, may also be responsible for part of the success. The outbreak may therefore be considered as having come to a close while its origin remains a complete mystery which may never be cleared up. The unusual virulent form of the outbreak will however necessitate the continuation of the quarantine for four to six weeks after the last death from cholera in either of the two places in question.

BOVINE TUBERCULOSIS CONTROL WORK.

As stated in last month's report bovine tuberculosis is so nearly eradicated that only very few herds now remain where the disease may be said still to be well established. One of these herds, belonging to one of the largest dairy men on Oahu, is shortly to be moved from its present location to a new modern dairy now under construction and located in a neighborhood where a great deal of milk is being produced and where all the dairy men have endeavored to free their herds of diseased cattle and with uniform success. Two of these dairy owners both of whom now possess clean herds strenuously object to having a diseased herd moved into their immediate neighborhood, and have strongly voiced their protests to this office. As bovine tuberculosis is now recognized and guarded against as a dangerous, infectious and contagious disease, transmissible to human beings, through federal, territorial and municipal statutes, laws, regulations and ordinances, it would seem that the protests in question, though without precedent, are well founded and demand the support of this Board. The statute creating the Division of Animal Industry gives the Board full power to quarantine any premises on which are kept live stock affected with infectious or contagious diseases. Federal regulations prohibit the shipment in interstate trade of animals so affected, while territorial laws and regulations prohibit their introduction into the Territory. Finally, a municipal ordinance forbids the sale of milk from animals so affected.

If therefore the owner in question should decide not to have his herd tested and freed of tuberculous animals before moving it the Board would of necessity be constrained to declare his herd and premises quarantined which measure would likewise prevent the removal of any milk from the premises. I have however recently called on the owner and urged him to comply with the requirements of the local sanitary authorities, and I have hopes that he will see the necessity of doing so. There is every reason to believe that the milk consuming public will not wittingly and

knowingly return to tuberculous milk as a steady diet for their children, and the owner might find it difficult to dispose of his milk should the conditions on his premises become known generally.

In this connection I am pleased to state that there is a prospect of the renewal of the municipal milk inspection in coöperation with this Board, Mr. Logan informing me that he intended to take the matter up with the members of the Board.

Respectfully submitted,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORTS OF ASSISTANT VETERINARIAN.

Honolulu, April 30, 1915.

Dr. V. A. Norgaard, Chief of Division of Animal Industry.

Sir:—I beg to submit the following report for the month of April, 1915:

Tuberculosis Control.

The following dairy cattle have received the tuberculin test during the past month:

	T.	P.	C.
Charles Lucas	102	102	0
E. W. Williamson.....	6	6	0

A total of 108 head have been tested all of which have been passed as free from tuberculosis.

At the end of 1914 the records showed 2.08% of tuberculosis for the entire Island of Oahu, this being a reduction from 31.25% in four years work and 2.82% of tuberculosis in the city herds proper, a reduction from 24% as found four years ago. At the present time 76.08% of the dairies of the City and County of Honolulu are free from tuberculosis and can be kept free from now on if the dairy owner is willing to exercise all possible precautions.

The test this year, which is the sixth annual test since the commencement of systematic eradication of bovine tuberculosis on the Island of Oahu, gives the following results to date:

<i>No. of Herds.</i>	<i>Total No. of Animals.</i>	<i>Number Passed.</i>	<i>Number Condemned.</i>
12	1,638	1,572	66

Out of the above herds, two were found heavily infected. One was tested for the first time this year and the other, although test-

ed a number of times previously, more than three times the number of animals were tested this year than at the last test. These two herds totalled 672 head with a total of 45 condemned animals.

In the city herds proper, with a total of 866 animals there have been condemned 21 head, giving a percentage of 2.4% of tuberculosis, which is almost one-half of one per cent less than that found in the city dairy herds in 1914. The above 2.4% includes a retest of one of the largest dairy herds where, up to the present test, there has always been a number of reactors.

As illustrative of the value of this work and the progress which is being made, it can be stated that when this campaign of eradication started in 1910, five years ago this month, the largest dairy herd in the Territory contained 75% of tuberculous animals, while today it contains but 1.2%, and it is safe to say that in a few more tests tuberculosis will be wiped out of this herd completely.

The above is only one of a number of cases which could be cited to show what has been accomplished since this work began and how close we are to the goal of total eradication. Should this work now be discontinued or be performed in a lax or half-way manner only a few years would have to pass before tuberculosis would again be prevalent throughout the island.

IMPORTATION OF LIVE STOCK.

Sierra, San Francisco: 11 crates poultry.

Lurline, San Francisco: 6 crates poultry; 6 cows (Durham), K. S. Co., care of C. Brewer & Co. One cow arrived suffering from a bilateral dislocation of the femero-sacral joints and had to be killed; 52 mules, Schuman Carriage Co.

Wilhelmina, San Francisco: 16 crates poultry; 2 cans gold fish, W. F. A. Co.

Arizonan, Seattle: 21 horses, 21 mules, 100 hogs for breeding, 181 hogs for slaughter, 2 Holstein cows; A. L. Macpherson.

Manoa, San Francisco: 11 crates poultry.

Korea, San Francisco: 1 dog, Mrs. H. Isenberg.

Matsonia, San Francisco: 21 crates poultry.

Manchuria, Orient: 4 Chinese geese, Mr. Lantang.

J. A. Chanslor, San Francisco: 1 dog, Sgt. Griggsbee.

Respectfully submitted,

L. N. CASE,
Assistant Territorial Veterinarian.

Honolulu, May 31, 1915.

Dr. A. V. Norgaard, Chief of Division of Animal Industry.

Dear Sir:—I have the honor to submit the following report for the month of May, 1915:

Tuberculosis Control.

The following dairy herds were tested during May:

	T.	P.	C.
Waialae Ranch	301	295	5
Waialae Ranch	106	106	0
Dr. C. B. Cooper.....	5	5	0
Mokuleia Ranch	434	432	2
J. McTaggart	2	2	0
K. Yamashita	1	1	0

From the above tabulated list it will be seen that a total of 849 animals were tested, 841 being passed as free from disease and 7 condemned. These condemned animals have already been slaughtered, five at the new slaughter house at Wahiawa and five at the Waialae slaughter house.

HOG CHOLERA.

In connection with the recent outbreak of hog cholera, nine trips of inspection have been made to Charles Bellina's ranch at Kulionou and three trips to P. M. Pond's pig farm beyond Leilehua. Both ranches were placed under quarantine and strict orders given to the effect that no persons or wagons be allowed on the premises except those directly connected with the care and feeding of the pigs; that no hogs be taken from the premises either for slaughter or for any other purpose except by express permission of this office whereby safe means of transportation could be guaranteed.

Notwithstanding our strict orders, on the 13th and 14th of May shipments totalling 24 hogs were sent from one of the above ranches to a Honolulu slaughter house, motor trucks being used as a means of transportation. This was in direct violation of quarantine and without any permit from this office. Only yesterday I found that a Japanese pig raiser from Mokuleia, who has been cutting green feed in exchange for swill, has been allowed to drive right on to the place and discharge his load of green stuff and wait a varying length of time for the arrival of the swill wagons. The chances are very good that during these waits this man walks over a large part of the farm. Under these

conditions it is a very easy matter for him to track the disease to his own place and so keep it spreading. No longer ago than last week the manager gave every assurance that this man never came further than the entrance from the main road.

At these periodical inspections every possible advice and help has been given regarding hygiene and sanitation, methods of treatment and dosage in vaccination, but something must now be done to enforce our quarantine regulations.

IMPORTATIONS OF LIVE STOCK.

Sierra, San Francisco: 9 crates poultry.

Lurline, San Francisco: 1 horse, D. Ferriera; 53 mules, Schuman Carriage Co. Kahului: 1 percheron stallion, 1 steel grey stallion, F. F. Baldwin; 1 crate poultry, Maui Agricultural Co.

Wilhelmina, San Francisco: 19 crates poultry.

Manoa, San Francisco: 13 crates poultry. Kahului: 3 crates poultry.

U. S. S. Columbine, San Francisco: 1 dog, E. H. Bartels.

Manchuria, San Francisco: 1 dog, Dr. F. L. Sanborn.

Matsonia, San Francisco: 12 crates poultry; 1 Angora cat, E. A. Knudsen.

Niagara, Sydney: 1 crate poultry.

Sierra, San Francisco: 1 parrot, W. F. X. Company.

Shinyo Maru, Yokohama: 1 dog, Mrs. Johnson.

Respectfully submitted,

L. N. CASE,
Assistant Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

REPORT FOR APRIL.

Honolulu, April 30, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the work performed by the Division of Entomology for the month of April, 1915, as follows:

During the month 51 vessels arrived at the port of Honolulu of which 26 carried vegetable matter. Six vessels came by the Panama Canal route.

<i>Disposal.</i>	<i>Lots.</i>	<i>Parcels.</i>
Passed as free from pests.....	846	17,752
Fumigated	4	4
Burned	48	49
Returned	4	4
<hr/>		<hr/>
Total inspected.....	902	17,809

Of these shipments 17,568 packages arrived as freight, 145 packages through the postoffice and 96 packages as baggage of passengers and immigrants.

RICE AND BEAN SHIPMENTS.

During the month 43,419 bags of Japanese rice, 500 bags of Chinese rice and 3,018 bags of beans arrived from the Orient, and after thorough inspection were found free from rice and bean pests and the shipments were allowed to be delivered.

PESTS INTERCEPTED.

Thirty-nine lots of fruit and 4 lots of vegetables were taken from the baggage of passengers and immigrants from foreign countries and destroyed by burning. A package of hopvine roots from California was found infested with white ants (*Termites*) and was destroyed by burning. This package had been passed as free from pests by a local inspector at place of shipment. I wrote to the County Commissioner of Los Angeles County and drew his attention to the matter. A cherry tree from Japan was infested with Aphids (*Shermes species*) and also contained a colony of ants. After fumigation and removal of soil the plant was passed. Two lots of gladiolus bulbs by mail and express were found infested with the bulb aphid. Both shipments were thoroughly fumigated before delivery. A shipment of rose plants was treated to fumigation on account of aphid infestation. A passenger brought a five-leaved pine tree from Japan, but under the federal regulation we refused its landing, such plants being prohibited from being brought into the United States. One package of tree seed from Manila came by mail and was returned as unmailable under rulings of the Federal Horticultural Board. Two packages of fruit were sent back on board the Transport Thomas as coming from Manila; they are prohibited from entry. Among a few palmseeds from Cuba we found one containing a large weevil and from another we got about 100 parasites (*Chalcids*), which appear to be the parasite of this palmseed weevil.

BENEFICIAL INSECTS.

Mr. D. T. Fullaway's work is reported on in his report attached hereto. As will be seen large quantities of the various parasites

have been liberated in sections most favorable at this season of the year. There has been considerable complaint of damage done by the Japanese rose beetle, and quite a lot of inoculated beetles have been distributed. Outlying districts surrounded by waste lands have suffered more than others.

HILO INSPECTION.

Brother M. Newell reports the arrival of eleven steamers and one sailing vessel of which six steamers brought vegetable matter consisting of 315 lots and 4,616 packages. One crate of turnips was destroyed on account of infestation of the cabbage maggot.

Seventy-nine sacks of potatoes were destroyed on account of being badly infested by the potato tuber moth. The Anyo Maru arrived direct from Japan with 8,974 bags of rice, 543 bags of beans and one bag of sesame seed, all of which were found free from pests.

Owing to the constant increase of steamers and vessels and the changing of crew I deemed it advisable to have our regulations printed in condensed form for posting on vessels coming into the port. Every vessel now arriving whether it remains here or is only passing through is furnished with several notices with a request to post them in conspicuous places on board the vessel.

INTER-ISLAND INSPECTION.

During the month of April 58 steamers plying between Honolulu and the ports of the other Islands were attended to. The following shipments were passed:

Plants	66 packages.
Taro	644 bags.
Vegetables	60 packages.
Fruit	4 "
<hr/>	
Total inspected.	774

The following packages were refused shipment on account of infestation or of having soil attached to the plants:

Plants	8 packages.
Fruit	14 "
<hr/>	
Total refused.	22 "

Respectfully submitted,

E. M. EHRHORN,
Superintendent of Entomology.

NOTICE.

Territory of Hawaii—Board of Commissioners of Agriculture and Forestry—Division of Entomology—Fruit and Plant Inspection.

Importations Subject to Inspection.

Nursery stock, tree, shrub, plant, flower, vine, cutting, graft, scion, bud, seed, root, fruit pit, fruit, vegetable leaf, nut or moss are inspected for insects and diseases liable to become injurious. Also queen bees and honey. Labels must be affixed to containers of the above shipments, giving name of shipper, locality of production, description of articles and name of consignees.

Importations Absolutely Prohibited.

Coffee trees or shrubs.

Cacao from Dutch E. Indies, Ceylon or India.

Fresh Fruit from E. or W. Indies, Asia, Australasia, Oceanica, Malaysia, Mexico, Central or South America.

Live Animals, including "Flying Fox" or "Fruit Eating Bat," "Land Crab," bird, reptile, or insect injurious or liable to become injurious.

Soil of any kind.

Rice infested with insects liable to become injurious.

Banana fruit, shoots or plants from Central America, Panama Canal Zone, West Indies, Dutch Guiana, Oceanica, Malaysia and the Orient.

All Sugar Cane from any part of the world.

Penalty for Violations.

Any person violating any of the provisions of this chapter, or any rule or regulations of the Board of Commissioners of Agriculture and Forestry, and any master of any vessel which shall bring into this Territory any article which the Board shall at any time prohibit from being imported into this Territory; and the master of any vessel from which shall be landed any article in this Act required to be inspected, until he shall have received a permit to land the said articles from the Board or its Officer or Inspector, as herein provided, shall be guilty of a misdemeanor, and shall be punished by a fine not to exceed \$500. (R. L. Haw., Ch. 28, Sec. 390, as amended by Act 112, Session Laws of 1907).

E. M. EHRLHORN,

Chief Plant and Fruit Inspector.

By order of the Board of Commissioners of Agriculture and Forestry. Territory of Hawaii, U. S. A.

REPORT FOR MAY.

Honolulu, May 31, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the work performed by the Division of Entomology for the month of May, 1915, as follows:

During the month 53 vessels arrived at the port of Honolulu of which 25 carried vegetable matter and one vessel moulding sand. Twelve vessels came by the Panama Canal route.

<i>Disposal.</i>	<i>Lots.</i>	<i>Parcels.</i>
Passed as free from pests.....	792	18,340
Fumigated	2	2
Burned	73	79
Returned	2	4
	<hr/>	<hr/>
Total inspected.....	869	18,425

Of these shipments 18,047 packages arrived as freight, 192 packages through the postoffice and 186 packages as baggage of passengers and immigrants.

RICE AND BEAN SHIPMENTS.

During the month 35,469 bags of Japanese rice, 50 bags of Chinese rice, 3,792 bags of beans, 272 bags of corn from Manchuria and 200 bags of buckwheat from Oriental ports arrived, and after thorough inspection were found free from rice, bean and grain pests and all shipments were allowed to be delivered.

PESTS INTERCEPTED.

Twenty-five lots of fruit and 38 lots of vegetables were taken from the baggage of passengers and immigrants from foreign countries and destroyed by burning. In the soil around a cherry tree from Japan a few grubs of *Anomala beetles* were found, also a colony of ants. A small package of beans in the mail from Japan was infested with the common bean weevil *Bruchus chinensis*, and was fumigated before delivery. A shipment of Hydrangea plants from Pennsylvania was infested with Aphids and fumigated before delivery. Four packages of seeds and plants from foreign countries arriving by mail were returned to the sender under the ruling of the Federal Horticultural Board as unmailable. A large quantity of tobacco belonging to a firm here was stored in our large fumigating house on Kilauea street and subjected to fumigation on account of being infested with the tobacco beetle.

BENEFICIAL INSECTS.

Mr. D. T. Fullaway's work during the month is reported on in his attached report. Large quantities of various parasites were reared and distributed on all the Islands. During the month further complaint was received regarding the damage caused by the *Japanese Rose Beetle*, and lots of inoculated beetles were furnished those who took the trouble to bring in beetles for inoculation. I have also had a circular printed giving instructions how to inoculate the beetles so that those living away from Honolulu can produce larger quantities of inoculated beetles for their own locality.

During the month I visited Hilo for the purpose of looking into the inspection work at that place. I found that the work has increased to some extent, and realize more than ever the necessity of having to provide other equipment in the very near future. I also visited the Kuhio Wharf for the purpose of finding out just when and where we can expect to put up the necessary equipment for handling the large shipments which will land at this wharf. It will be some time yet before any definite plans can be made owing to the unfinished condition of the wharf.

HILO INSPECTION.

Brother H. Newell reports the arrival of ten steamers, five of which brought vegetable matter consisting of 169 lots and 1889 packages. Excepting for one package of turnips which were infested with the cabbage maggot and two lots of gladiolus bulbs which were infested with the bulb aphid all shipments were passed as free from pests. The turnips were destroyed and the gladiolus bulbs were fumigated before delivery.

INTER-ISLAND INSPECTION.

During the month of May 67 steamers plying between Honolulu and the ports of the other islands were attended to. The following shipments were passed:

Plants	79	packages.
Taro	742	"
Vegetables	93	"
Fruit	6	"
<hr/>		
Total inspected	920	"

The following packages were refused shipment on account of infestation or of having soil attached to the plants:

Plants	12	packages.
Fruit	9	"
	<hr/>	
Total refused	21	"

Respectfully submitted,

E. M. EHRLHORN,
Superintendent of Entomology.

REPORT OF INSECTARY.

Honolulu, April 30, 1915.

E. M. Ehrhorn, Esq., Superintendent of Entomology.

Dear Sir:—Permit me to report the following operations in the insectary during the month of April, 1915:

Bred 6,900 *Tetrastichus*, 1,129 female and 2,258 male *D. fullawayi*, 138 female and 276 male *D. tryoni*, 475 *Spalangia*. These were liberated as follows:

Tetrastichus: 2,700 Nuuanu Valley, 2,000 in the insectary, 800 Tantalus, 100 U. S. Experiment Station, 400 Piikoi St.

D. fullawayi: 588 Nuuanu Valley, 190 in the insectary, 35 U. S. Experiment Station, 35 Piikoi Street, 20 Kalihi, 230 Tantalus, 35 Pensacola St.

D. tryoni: 70 Nuuanu Valley, 10 Pensacola St.

Spalangia: 375 Waialae, 100 insectary.

In producing the above parasites there were used for *Tetrastichus* 3,000 pupae, and the parasitism is therefore in the neighborhood of 15%; for *D. fullawayi* about 21,000 pupae, parasitism 5%; for *D. tryoni* about 11,000 pupae, parasitism 1%.

Respectfully submitted,

D. T. FULLAWAY.

Honolulu, May 31, 1915.

E. M. Ehrhorn, Esq., Superintendent of Forestry.

Dear Sir:—I submit herewith my report on the work of the insectary for the month of May, 1915:

Bred 21,800 *Tetrastichus*, 1,043 female and 2,086 male *D. fullawayi*, 348 female and 696 male *D. tryoni*, 900 *Spalangia* and small colonies of other fruit fly and dung fly parasites. Parasites were liberated in the following numbers at the places named:

Tetrastichus: 11,200 Nuuanu, 3,400 Tantalus, 1,500 Piikoi

street, 1,200 Insectary, 1,000 Hilo, 100 Koloa, Kauai, 200 Kaunakakai, Molokai, 200 Haiku, Maui, and 20 Waiakoa, Maui.

D. fullawayi: 659 Nuuanu, 101 Tantalus, 37 Piikoi street, 69 Insectary, 50 Hilo, 15 Haiku, Maui, 15 Waiakoa, Maui, 25 Koloa, Kauai, 8 Kaunakakai, Molokai.

D. tryoni: 172 Nuuanu, 26 Tantalus, 14 Piikoi street, 36 Insectary.

African Spalangias: 700 Moanalua, 200 Insectary.

Opus humilis: 100 Kaunakakai, Molokai; 50 Kalaupapa, Molokai, 200 Hilo.

Philippine pteromolid: 700 Moanalua.

Muscidifurax vorax: 700 Moanalua.

Calcsus silvetsii: 250 Nuuanu.

Dirhinus giffardii: 50 Haiku, Maui.

In producing the above parasites there were used for *Tetrastichus* 4100 pupae, estimated parasitism 35%; 17,900 for *D. fullawayi*, estimated parasitism 6%; 3950 for *D. tryoni*, estimated parasitism 4%.

Respectfully,

D. T. FULLAWAY.

DIVISION OF FORESTRY.

REPORT FOR APRIL.

Honolulu, May 14, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit the following routine report for the Division of Forestry for the month of April, 1915:

KAUAI TRIP.

From April 21 to 24, I was on windward Kauai investigating the need for forest fences in the region of Anahola. The Makae Sugar Company last February completed the fence required by government lease on the Kealia Forest Reserve boundary across the mauka government lands of Kamalomalo and Anahola. In order to protect the rest of this reserve in the region of Anahola Ridge and prevent cattle from getting into the forest, it will be necessary for the government to build a fence beginning at the north end of this new fence and running east along the Anahola River, which is the reserve boundary, and around the point to the land of Aliomanu, a distance of approximately 2.7 miles. The fence should not end here, however, for if it did, cattle could still get into the reserve. It should therefore be continued approxi-

mately .8 mile north to connect up with the fence across the makai boundary of the Moloaa Reserve, recently completed by Mr. C. A. Rice. By building this 3.5 miles of fence the forest reserve in this region will be completely protected from cattle which now wander into it. I plan to use the services of our newly appointed Forest Ranger, Mr. Kaina D. Lovell, in constructing this fence.

A brief visit around Lihue, Kauai, showed the continued interest that is being shown in forest tree planting on an extensive scale by people who are now beginning to reap the harvest of earlier plantings and are selling the wood for local use.

FENCE WIRE.

Four bids were received on April 30 in response to the call for tenders for furnishing No. 8 galvanized fence wire, but those necessarily were all rejected on account of the desire, expressed at the Board meeting of April 28, that a better quality of wire with more lasting properties be used in our forest reserve fencing. In accordance with the directions of the Board I have inquired concerning the best quality of wire available and find that it would be useless to attempt now to secure English wire on account of the great uncertainty of delivery and very high price due to the war. I find that an American Special No. 6 extra heavy-coated galvanized fence wire manufactured by the American Steel & Wire Co. has been used with equal satisfaction as the English wire on Hawaii, and I propose soon to call for bids on a sufficient amount of this wire to fence twenty miles of forest reserve boundary.

GRASS CUTTING ON TANTALUS.

A complaint was received concerning grass cutting on Tantalus and was at once investigated. No permits have been issued since last summer for this purpose, but it seems evident that some loads of grass or honohono have been cut from time to time from the government forest reserve in this region. Ranger Kapihi was several times instructed to keep closer watch to prevent this trespass and he has been required to move up to his mauka house where he is now on hand to warn grass cutters to keep off the reserve.

APPOINTMENTS.

To fill the vacancy caused by the resignation of Mr. Wilbur A. Anderson, Mr. John S. Goodell of Nahiku, Maui, was on April 28 appointed District Fire Warden for that portion of Koolau, Maui, lying to the east of Makapipi Gulch.

On May 1, Mr. Kaina D. Lovell of Anahola, Kauai, was ap-

pointed Forest Ranger for that island. It is a pleasure to be able to take this advance step toward the better administration of our forest reserves. Ranger Lovell's work will consist chiefly in constructing fences at first, to be followed by the prevention of trespass and some planting work. He will continually be on the watch for forest fires.

APPLICATION FOR AWA.

An application was received during the month for permission to take awa from the unsurveyed government land mauka of the homesteads between Pahoa and Kaimu, District of Puna, Hawaii. On account of the absence of reliable precedent in handling such a permit, before referring the application to the Board I prefer first to investigate the matter on the ground in order to determine the value of the material to the government and the feasibility of issuing and handling such a permit.

A report on the activities in the department of the Forest Nurseryman is, as usual, appended to this report.

Respectfully submitted,

C. S. JUDD,
Superintendent of Forestry.

REPORT FOR MAY.

Honolulu, June 10, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit the following routine report for the Division of Forestry for the month of May, 1915:

FENCING ON KAUAI.

The construction of the proposed 3.5 miles of fencing along the reserve boundary at Anahola, Kauai, mentioned in my April report, has not yet been started because as yet it has not been possible to secure the services of a local surveyor to run out two lines along the boundary of government land. These lines must be definitely located before the fence can be constructed and the building of the remainder of the fence would not be effective unless this gap is also fenced. I am in correspondence with parties who can do this surveying and hope soon to have it completed so that the fence construction can proceed.

FENCE WIRE.

On May 15, a call was issued for bids for furnishing 520 coils of No. 6 gauge American special extra heavy-coated galvanized fence wire, bids to be opened early in June. This was the kind of wire found after inquiry to be the most durable wire available and decided upon with the Commissioners who were in town as being the best to use in our forest reserve fencing.

FOREST FIRE NEAR HILO.

On March 29, 1915, a fire started on the Government leased land of Piihonua, near Hilo, Hawaii, and raging for four days before it was extinguished by men working under the direction of District Fire Warden John A. Scott, endangered cane fields and burned over some 200 acres of pasture and forest land belonging to the Hawaiian Evangelical Association, Lyman Estate, Hilo Sugar Co., and Ponahawai Coffee Co. It was started by a native who was burning brush when a strong wind came up and scattered the fire in spite of his efforts to control it. The fire did not reach within more than a mile of the Hilo Forest Reserve.

TRIP TO MOLOKAI.

The last six days of May and a few days in June were spent on the Island of Molokai becoming acquainted with the condition of the forest reserve on that island. Most of the western end of the reserve on the leeward side of the island or all of the lands under the control of the American Sugar Co. in the reserve were fenced about 16 years ago and the results of keeping out the cattle and reducing the number of wild deer and goats are already most gratifying. Where the former damage was not unusually severe the native forest consisting mostly of Ohia lehua is coming back naturally in a profuse manner. Swamps that were formerly drying up on account of the damage to the forest are becoming very wet again and will soon be impenetrable on account of the bog and new forest growth. These good results are a strong argument in favor of the protection of our native forests. Where previous damage was excessive in this part of the reserve tree planting to a certain extent has been done by the American Sugar Co., with excellent results.

The conditions on the leeward side of this reserve further to the east, where very little government land is involved, are somewhat different. Here the country is more broken up by steep gulches and although there is practically no fencing along the forest reserve boundary, in only a few places on private lands have cattle gotten into the woods. There are no wild goats in this region. The majority of the lands here are privately owned

and as yet little fencing has been done by the owners on account of the expense. Almost all of the few strips of government land which run into the reserve have clauses in the lease of the land below the reserve boundary requiring fencing. While all of this fencing has not yet been completed, a start has been made by some of the lessees. The only unleased government land in this part of the reserve, in which the government owns a half interest, I found to be a very narrow ridge bordered by steep gulches. Cattle are entirely absent and no damage has been done to the splendid forest of young Ohia trees.

A curious and gratifying result of the killing of the lantana by blight in the gulches in this region has been the springing up of young Kukui trees in great quantities.

PUBLICATIONS.

Upon the exhaustion of Circular No. 2 of this Division, "Instructions for Propagating Forest, Shade and Ornamental Trees," by David Haughs, which is handed out to those who do tree planting, a new supply was printed during the month.

Respectfully submitted,

C. S. JUDD,
Superintendent of Forestry.

REPORTS OF FOREST NURSERYMAN.

Honolulu, May 13, 1915.

C. S. Judd, Esq., Superintendent of Forestry.

Dear Sir:—I herewith submit a report of the principal work done during the month of April.

NURSERY.

Distribution of Plants.

	In seed boxes.	In boxes trans- planted.	Pot Grown.	Total
Sold	80	80
Gratis	915	915
	—	—	—	—
	995	995

COLLECTIONS.

Collections on account of plants sold amounted to.....	\$ 1.80
Rent of building, nursery grounds, 4 mos., Dec. to Mar.	140.00
Total.....	<u>\$141.80</u>

PLANTATION COMPANIES AND OTHER CORPORATIONS.

Under this heading the distribution of plants is as follows:
 11,000 seedlings; 3050 in transplant boxes; and 300 pot grown
 Total, 14,350.

MAKIKI STATION.

The transplanting of seedlings, mixing and sterilizing soil and attending to the other trees of the station has constituted the principal work.

HONOLULU WATERSHED PLANTING.

During the month the trails in the vicinity of Sugar Loaf hill have all been cleared. A new trail starting in the main Makiki Valley, about half a mile above the Makiki Station and running across the ridge to Herring Valley and continuing along the Ewa side of this valley until it joins the trail from Sugar Loaf below the springs has been completed. This trail will make it practical to use the small nursery at the base of Sugar Loaf while the planting is being done in Herring Valley and on the adjoining ridge.

As a protection against fires the clearing off of some of the old trails and making new ones where required is necessary work at this time. The dry season is coming in and the dense growth of Hilo grass which is to be found on those precipitous slopes would, in the event of a fire starting, make it very difficult to control. Consequently the trails have been arranged with this idea in view.

ADVICE AND ASSISTANCE.

The writer has been called upon to make visits and give advice as follows: Visits to places in and around the city, 10; advice by telephone, 12; advice to people calling at the nursery, 8; advice by letter to people on the other islands, 4; total, 34.

Respectfully submitted,

DAVID HAUGHS,
 Forest Nurseryman.

Honolulu, June 14, 1915.

C. S. Judd, Esq., Superintendent of Forestry.

Dear Sir:—I herewith submit a report of the principal work done during the month of May:

NURSERY.

Distribution of Plants.

	In seed boxes.	In boxes trans- planted.	Pot Grown.	Total.
Sold . . . . .	....	101	80	181
Gratis	2000	1250	728	3978
	<hr/> 2000	<hr/> 1351	<hr/> 808	<hr/> 4159

COLLECTIONS.

Collections on account of plants sold amounted to.....	\$ 5.40
Rent of buildings, nursery grounds.....	35.00
Total.....	<hr/> \$40.40

PLANTATION COMPANIES AND OTHER CORPORATIONS.

The distribution of plants under this heading amounted to 3500 in transplant boxes.

SEED COLLECTING.

The seed season for a large number of forest and ornamental trees is just coming in and the two collectors are kept busy. Tantalus and Nuuanu Valley have been searched in vain. No good Koa seed can be found. We are in hope of being able to procure some Koa seed from Kona and have written to a party who resides there about it.

SEED EXCHANGE.

The seed exchange system started by us during the year 1907 and kept in operation ever since has been of mutual benefit to ourselves and also to Botanic Gardens, Experiment Stations, Nurseries and other institutions and individuals throughout the different countries listed below. Our foreign list contains the names of 79 institutions and individuals with whom we exchange seed from time to time. All of those named have received seed from

us during the past eight years and we have assurances from each that they will gladly forward full lists of samples at any time we desire same. We have received lists from a number of these. The lists comprise ornamental and forest trees, shrubs, creepers, palms and annuals. The number of species varies according to the size of the institution. The lists of seed sent out from the Nursery here generally contain about 100 species. By keeping in touch with those institutions we are in a position, should we at any time in the future find it necessary to do more experimenting with trees on the higher lands or elsewhere, to call on them for seed. The following is a list of the different institutions which constitute our seed exchange:

EXCHANGE LIST.

Gardens and parks, 2; nurseries, 4; acclimatization gardens, 1; botanic gardens, 53; forest departments, 4; experiment stations, 5; agricultural departments, 6; collectors, 4; total, 79.

The following is a list of the countries, giving the number of institutions, etc., in each with which we have been in communication and exchanged seed during the past eight years:

Africa, 8 institutions; Australia, 12; Argentina, 1; Belgium, 1; Brazil, 4; Cuba, 1; China, 2; Chili, 1; Ceylon, 1; Cochin China, 2; Great Britain, 2; Fiji, 1; France, 2; Germany, 1; Greece, 1; Guiana (British), 1; India, 12; Japan, 3; Java, 1; Federated Malay States, 2; New Zealand, 2; Peru, 2; Straits Settlements, 3; Tasmania, 1; West Indies, 12; total, 79.

In addition to the above we have on our regular exchange list and have exchanged seed with each of the following: The Forestry Department, Manila; the Experiment Station, Guam; and on the mainland: Botanic Gardens, Washington, D. C.; Arnold Arboretum, Massachusetts; Harvard Experiment Station, Cuba; Botanic Laboratory and Gardens, Johns Hopkins University, Baltimore, Maryland; Prof. Albert Akerman, School of Forestry, University of Georgia; Harvard Botanic Gardens, Cambridge, Massachusetts; Office of Seed Introduction, U. S. Department of Agriculture, Washington, D. C.; New York Botanic Gardens, Bronx Park, N. Y.; Botanical Desert Laboratory, Tucson, Arizona; Missouri Botanical Gardens, St. Louis, Missouri, and Acclimatization Society, Santa Barbara, California.

MAKIKI STATION.

In addition to the regular routine work some needed repairs have been made to the buildings. The boiler and sterilizer have been treated to two coats of paint and part of the buildings given a coat of green stain.

In addition to the regular stock of plants which are always in

demand we have at present at this station a number of plants raised from seed which we have received through our exchange system, a few of which are worthy of note. *Juniperus Australis*, about 2500 plants from seed received from Jamaica. Camphor tree, about 200 plants from seed received from Formosa. From Australia, *Maleluca*, three species (the paper bark tree of Australia). We have about 1000 plants of each species. Several species of *ficus* from India, including the *Ficus religiosa*, the sacred tree of the Hindoos. We have a number of other species containing small quantities of each coming along, some of which look very promising.

HONOLULU WATERSHED PLANTING.

The work done during the month has been principally hoeing, making holes and planting. The lower slope of Herring Valley is being planted with Kukui. 350 Kukui trees have been planted during this month. The trees formerly planted are doing very well and a large number of them are now above the grass and guava bushes and are able to take care of themselves.

ADVICE AND ASSISTANCE.

The writer has been called upon to make visits and give advice as follows: Calls, 6; advice by telephone, 10; advice at nursery, 8; by letter, 4; total, 28.

Respectfully submitted,

DAVID HAUGHS,
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

REPORT FOR APRIL.

Honolulu, May 11, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the Division of Hydrography during April, 1915, is submitted:

WEATHER CONDITIONS.

The early part of the month was extremely dry. On April 8 the drought was broken on Maui and all East Maui ditches were filled to capacity. During the middle of the month light rains fell generally over the islands and during the week ending April 24, the precipitation was, with a few exceptions, above the average.

During the latter part of the month heavy rain storms occurred in the Hilo, Hamakua and Puna districts on Hawaii; and at several points on Kauai, Maui and Oahu. At Hana, Maui, on April 27, 24.3 inches of rain fell in three and one-half hours, and a great damage was done to roads, bridges and crops. On Oahu heavy rainfall during the last week of the month enabled us to obtain much needed flood measurements on the stations maintained in coöperation with the Kahuku and Laie plantations. These stations were established to determine the feasibility of storing storm water in that vicinity for irrigation of fields that are now irrigated by pumped water.

On Kauai heavy rains fell after April 20. On April 27th four inches of rain fell on the McBryde Plantation, and the Wainiha Power Plant was shut down as not being needed,—the first time in three years.

1914 RAINFALL RECORDS.

That the Hawaiian Islands were bountifully supplied with rainfall during 1914 is demonstrated by the following records which have just been completed. These are only part of the stations maintained by the Division of Hydrography, or to which private records are furnished.

KAUAI.

Mt. Waialeale, elevation 5080 feet, over 600 inches. (Partially estimated).

Hānapepe Valley, elevation 2080 feet, 256 inches.

Wainiha Valley, elevation 700 feet, 223 inches.

Wainiha Power House, elevation 125 feet, 186 inches.

Wainiha Ridge, elevation 1900 feet, 224 inches.

Lehuamakanoi, elevation 3930 feet, 186 inches.

Kapaka, elevation 635 feet, 182 inches.

OAHU.

Nuuanu Pali, elevation 1200 feet, 138 inches.

Wahiawa (mauka), elevation 1200 feet, 230 inches.

MAUI.

Waihee Valley, elevation, 1500 feet, 460 inches.

Puu Kukui, elevation 4300 feet, 429 inches.

Keanae, elevation 1000 feet, 397 inches.

Iao Valley, elevation 1500 feet, 240 inches.

Honokohau, elevation 800 feet, 255 inches.

Kula Pipe Line, elevation 4300 feet, 330 feet (about).

Honolua Ranch, elevation 800 feet, 255 inches.
 Mt. Eke, elevation 4500 feet, 270 inches (about).
 Honomanu, elevation 1800 feet, 361 inches.
 Kopiliula, elevation 1225 feet, 356 inches.
 Waikamoi, elevation 1275 feet, 392 inches.

HAWAII.

Kahawainui (Upper Hamakua Ditch), elev. 4080 ft., 504 in.
 Alakahi (Upper Hamakua Ditch), elev. 3870 ft., 350 in.
 Kahawainui (Lower Hamakua Ditch), elev. 1040 ft., 308 in.
 Koiawe (Upper Hamakua Ditch), elev. 3350 ft., 217 in.
 Koiawe (Lower Hamakua Ditch), elev. 1000 ft., 211 in.
 Waima (Lower Hamakua Ditch), elev. 980 ft., 192 in.

CHANGES OF PERSONNEL.

C. T. Bailey, assistant engineer, sailed on the April 5th U. S. Army transport to spend three months accumulated leave on the mainland, and three months in the Washington, D. C., office of the U. S. Geological Survey on general office and executive training work. He expects to return to Honolulu about November 13, 1915.

R. C. Rice, formerly office engineer for the California district of the U. S. Geological Survey, arrived on April 13, and will act as office engineer for this Division in the future.

The services of R. D. Kliss, assistant engineer, of the Philippine service, have been secured, and Mr. Kliss will report for duty about July 1st.

Kauai.

The construction work on the new Kapaa stream and ditch measurement stations was practically completed. Floods during the latter part of the month delayed this work. All stations in the upper Waimea water shed were visited and minor repair work was done. All continuous record stream measurement stations on windward Kauai were visited.

Mr. Hardy spent 25 days in the field, visited ten stream measurement stations, and made 15 stream measurements. Mr. Horner spent 28 days in the field, principally on construction work.

Oahu.

Three coöperative continuous record stream measurement stations were established in the upper Punaluu and Kaluanui valleys. The cost of these stations was paid by the Koolau Agricultural Co., Ltd. The stations will be used to determine whether

the Punaluu and Kaluanui Streams may be used to develop hydro-electric power for pumping on Kahuku Plantation.

Miscellaneous measurements were made of the outflow from the Waiawa portal of the Waiahole tunnel, the flow from the new Y. M. C. A. well, and of the Afong ditch in upper Nuuanu Valley.

G. K. Larrison spent 13 days in the field, visited four stream and two rainfall measurement stations, and made three miscellaneous measurements.

H. A. R. Austin spent 23 days in the field, visited 20 stream and three rainfall measurement stations, and made 18 stream and ditch measurements at regular stations and nine miscellaneous measurements.

R. C. Rice spent 11 days in the field, visited two stream measurements at regular stations and one miscellaneous ditch measurement.

The outflow from both portals of the Waiahole tunnel continues to diminish. The Waiahole portal, including "R" tunnel, now has a discharge of 28 million gallons per day, and the Waiawa portal 13 million gallons per day.

Maui.

Only routine maintenance work was done. G. K. Larrison visited all continuous record stream measurement stations, and one rain gage on the Iao Valley tableland. This rain gage had been tampered with and the receiver reversed so that the annual record was spoiled. The gage was also badly battered, apparently by a cane knife.

Hawaii.

G. K. Larrison spent five days in the vicinity of Waimea making measurements in the Waikoloa drainage area, locating old ditches and assisting the Attorney-General in collecting evidence relative to the flow of the stream and the ditches diverted therefrom.

MAY PLANS.

Kauai.—The Kapaa measurement stations will be completed. New copper rain gages of increased capacity will be established on Kilohana lookout, elevation 4020 feet and Mt. Waialeale, elevation 5080 feet.

Oahu.—Make needed measurements to complete ratings of stream measurements stations, and make minor repairs to existing stations.

The commanding officer of the Hawaiian Department U. S. Army has requested that this office make "an examination of con-

ditions affecting the water supply at Schofield Barracks," and advise him on the subject. The examination and report will be made during May.

Data relative to the Honolulu water supply will be prepared, and furnished to the City and County Engineer.

Maui.—A large amount of minor repair and maintenance work will be done, and stream measurements will be made. The Iao tableland rain gage will be moved to a more secluded locality.

Hawaii.—G. K. Larrison will be subpoenaed to appear as a witness at Waimea, Hawaii, about May 26, to furnish evidence pertaining to the Waikoloa water case.

Very respectfully,

G. K. LARRISON,
Superintendent of Hydrography.

REPORT FOR MAY.

Honolulu, June 9, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the Division of Hydrography during the month of May, 1915, is submitted:

WEATHER CONDITIONS.

There was light to moderate rainfall throughout the islands during the first part of May. During the latter part of the month only light showers occurred and the precipitation was generally below the average. Kauai showed the lowest average monthly rainfall in the island group,—below one inch. On May 21, when Mr. Hardy visited Mt. Waialeale, Kauai, elevation 5080 feet, the effect of this deficient rainfall on the high mountains was very noticeable.

KAUAI.

During the month construction work was completed on the new gaging stations on Kapaa Stream and Kapaa ditch. Construction work on the new gaging station on Anahola ditch was practically completed.

A 300-inch rain gage was installed on Mt. Waialeale, elevation 5080 feet, and a rain gage on Kilohana lookout, elevation 4020 feet, was replaced by one of 120 inches capacity.

Most of the gaging stations on Kauai equipped with water stage registers were visited during the month, and necessary minor repairs made.

Mr. Hardy spent 26 days in the field, visited 18 stream and five rain gage stations, and made 16 regular and one miscellaneous discharge measurements.

Mr. Horner spent 28 days in the field on construction work, visited eight stream measurement stations, 14 rain gage and three evaporation stations, and made four discharge measurements.

OAHU.

A gaging station was established on a ditch that diverts from East Branch of Manoa Stream above our gaging station. Maintenance work was done on several stations in the vicinity of Kahuku.

A field examination of conditions affecting the water supply at Schofield Barracks was made at the request of the commanding officer of the Hawaiian Department, U. S. Army. A report of this examination is in preparation.

Necessary low stage discharge measurements were secured at several of the gaging stations.

The outflow of the Waiahole portal, including "R" tunnel, of the Waiahole tunnel was found on May 7 to be 28 million gallons per day. Inflow between the Waiahole portal and the Division of Hydrography gaging station below the power house, including discharge from "A" tunnel, amounted to about five million gallons per day.

At the request of the Governor, a topographic map of Oahu was prepared in colors, showing the areas of land owned by the Territory, Army and Navy reservations, homesteads, and forest reserves, and the locations of the stream gaging stations and rainfall stations maintained in coöperation with the U. S. Geological Survey. This map shows in a comprehensive way the economic relation of the surface water investigations to the territorial land divisions of Oahu.

G. K. Larrison, superintendent, spent five and one-half days in the field chiefly in connection with the field examination of the water supply for Schofield Barracks, and visited five stream measurement stations inspecting the water stage registers. He was on leave one day.

C. T. Bailey, assistant engineer, was on annual leave the entire month.

R. C. Rice, assistant engineer, spent most of the month in the office computing water stage register records, arranging technical files and preparing rating curves for several stations. He spent one and one-half days in the field, visited five stream and one ditch stations and made two measurements at regular stations.

H. A. R. Austin, junior engineer, spent eight days in the field, visited 13 stream and four rainfall stations, and made seven regular and six miscellaneous discharge measurements.

MAUI.

Much needed repairs were made to the gage well and cable equipment at the Iao station. A new 300-inch rain gage was installed at Waihee to replace the old one which leaked.

The Iao tableland rain gage was moved to a more secluded locality where it is hoped it will not be again tampered with.

H. A. R. Austin spent 12 days in the field, visited 18 gaging stations, three rain gage stations, and made one regular and two miscellaneous measurements.

HAWAII.

The water rights suit brought by the Parker Ranch against the Territory opened this month at Waimea, Hawaii. The case involves the adjudication of the water rights in Waikoloa stream.

G. K. Larrison, superintendent, representing the Division of Hydrography, spent May 23 to 31 at Waimea as a witness for the attorney-general. At the close of the month he was still at Waimea.

JUNE PLANS.

Kauai.—Considerable minor repair and maintenance work will be done and discharge measurements secured.

Oahu.—Several minor repairs and maintenance work will be done, and measurements secured where needed.

Maui.—Necessary repairs will be made and measurements secured.

Hawaii.—G. K. Larrison will be at Waimea as a witness on the water right suit between the Parker Ranch and the Territory.

Very respectfully,

ROGER C. RICE,
Acting Supt. of Hydrography.

FUNDAMENTAL PRINCIPLES OF CO-OPERATION IN AGRICULTURE.

BY G. HAROLD POWELL.

(*Circular of College of Agriculture, University of California.*)

(Concluded.)

MEMBERSHIP AGREEMENT.

A coöperative organization to be successful must be held together by a membership agreement or contract holding the members together for business purposes. In no other way can an association attain that degree of stability that is necessary in a business undertaking. The association must know definitely what it is expected to do, the volume of business to be handled, the expenses to be incurred and the preparation necessary to be made to transact its affairs in an orderly, economical manner.

Voluntary membership is usually suicidal in a coöperative association. In the last analysis the association can only succeed when the average member believes that the coöperative principle is sound; and that conviction must be strong enough to hold the members together when their opponents attack them insidiously and persistently. This faith must be founded on the sound business results of the organization, as well as on its larger influence on the development of the industry as a whole. Unless the benefits of the organization are large enough to keep the organization intact, the members cannot be held together indefinitely by any form of contract; but the human nature of the average farmer has not evolved to that ideal point when a temporary advantage offered him by an opponent may not blind him to the permanent advantages of the association to which he belongs. A membership agreement is a steadying influence on a grower who might be led astray by misrepresentation or by temporary dissatisfaction. Then, too, there are large numbers of farmers who are opportunists. They have no interest in the industry as a whole. They are interested only in their own immediate success. In handling their crops they are rampant speculators. They follow a sharp-shooting marketing policy, trying to hit the high spots presented by an association, a buyer, or a commission merchant and giving but lukewarm allegiance to any individual or association. The opponents of the coöperative system understand this psychological trait perfectly, and unless the producer has formally bound himself to his association by a definite contract to handle all his produce through it for a given period of time they draw heavily from the membership by promising a larger return, or by playing upon his prejudices in other ways. It is

an historical fact that a large proportion of the troubles and failures in the coöperative movement have been due to the irresponsibility of the membership whenever an association has been subjected to fire; and no one not experienced in the movement can have any conception of the degree to which misrepresentation, insinuation and other modes of creating disaffection are persistently kept before the coöperative producers by those who make an abnormal profit when the farmer's product is handled individually. The same kind of misrepresentation is used in building up one association as against another when those who handle the business of a coöperative association are interested in profits, or derive their compensation from the volume of business handled.

THE MANAGEMENT OF A COÖPERATIVE ASSOCIATION.

The success of a coöperative organization depends primarily on the loyalty and stability of the membership; it depends further on efficiency in management. Efficiency in management cannot exist without stability of membership; nor can it be developed unless the members appreciate the necessity of providing an efficient management. The difficulty in most coöperative organizations is the lack of appreciation of the need of a high order of organizing and business ability on the part of the employees of the association. The common failure of coöperative associations is usually attributed to inefficient management; as a matter of fact, it is due to the membership itself, which has fallen short in securing skillful employees. The individual producer is likely to gauge the requirements of management by the size of his own business. He falls short in his estimate when he acts on a board of directors and is charged with the responsibility of providing a management to handle successfully a collective business. Inefficient management is a measure of the degree of business efficiency of those who are charged with the direction of the affairs of the association; and unless the membership will sustain a board of directors in employing men of a high order of ability a coöperative association is short lived.

The management of a coöperative organization is more difficult than that of an ordinary corporation. The stockholders, not being experts in the affairs of the latter, do not often take an active interest in its details. The producer, on the other hand, is vitally interested in his own business and he is likely to take an active part, at least in giving advice concerning the conduct of the business. This is one of the most valuable assets in a coöperative organization if the manager is big enough to utilize it. Through the knowledge of the producer in the affairs of his association his interest and sympathy can be kept vital. If the management becomes autocratic, the interest of the member dies; if it is not big enough to work out a broad, progressive business policy, using

such suggestions as are made by the producers in addition to its own knowledge and experience, it in turn loses its connection with the association. A management must possess tact, constructive ability, foresightedness, fearlessness in the conduct of the business and a clear conception of the real underlying purpose of the organization, if it is to succeed. The integrity of the management must be beyond reproach; it must be free from entangling business alliances; it must be free from the participation in any secret profits arising directly or indirectly from handling the business of the organization; in short, the dealings of the management with the organization must be an open book, free from questionable business practices of every kind. The influence of the management, next to the loyalty of the members, exceeds all other influences and the success of a coöperative association depends on its working out in mutual confidence an efficient business system that is able to meet successfully all conditions as they arise.

A COÖPERATIVE ORGANIZATION SHOULD BE FOUNDED ON A
SPECIAL CROP.

A coöperative organization should be founded on a special crop and the locality in which it handles the product should be comparatively restricted. Special industries involve common problems to be solved by the producers, similar difficulties to overcome, similar trade practices and similar trade connections. The members of an organization that is formed to handle fruit, vegetables, poultry and general farm crops have no common ground on which to stand, and these general associations have not been successful up to the present time because the membership cannot be held together. The citrus fruit growers of California are all interested in increasing consumption, in extending markets, in reducing the cost of distribution and marketing, in securing reasonable transportation costs, and in the same public policy questions that affect the industry. They have therefore developed a vitality in their organizations that have been attained in no other agricultural industry in America. An organization founded on different crops, on the other hand, has a series of totally different problems to meet at one time, different business connections to form and different classes rather than one class of opponent to meet.

A COÖPERATIVE ORGANIZATION MUST DEVELOP THE INDIVIDUALITY
OF EACH LOCALITY.

To be successful a coöperative association must sustain and develop the individuality and initiative of the different localities in which it operates. The unit of the organization must therefore be a locality in which the soils, the climate and other conditions produce a similar grade of product. If the products vary

widely in color, texture, form or in other character, on account of the conditions under which they are grown, the producers cannot be held together because the grades cannot be made similar. The attempt to have a single organization cover a wide territory is therefore likely to fail. No amalgamation of the farmers of different localities in a common organization has ever been successful. On the other hand, the orange growers of one locality or of similar parts of a locality which produces similar grades of fruit, may organize to prepare their product for market under distinct local brands. Those of another may do the same thing, and a large number of local units may be formed as long as the unit embraces a product of similar grades and character. Then as a matter of economy and efficiency these local units may federate and create a central agency through which they handle their common problems. But each local unit preserves its local character and develops its local pride and reputation by selling its products under a brand that is the exclusive property of the local association. In addition to its local brand it may also add a brand of the central agency in order to give it greater selling power in all parts of the country; but no local unit should use the brand of a central agency exclusively, without using its own brand at the same time.

HANDLING, GRADING, AND PACKING.

The outcome of a coöperative organization formed to handle the growers' product will succeed or fail on the skill and integrity with which the product is harvested, handled, graded, and packed. The limits of this discussion will not permit this part of the subject to be handled in detail. A few fundamental principles, however, can be stated:

1. In the average association the individual grower does not possess sufficient skill to harvest, handle, grade or pack his product carefully, uniformly or attractively enough to permit the association to establish a standard of quality and therefore acquire a reputation for its brands or grades. A uniform standard of quality in the brands shipped by an association is fundamental to success. This seems like an axiom, but the fact is that this is the rock on which many coöperative organizations have been dashed to destruction. Poor handling in harvesting, improper handling in preparing the product for sale, careless or dishonest grading, or lack of skill and knowledge in grading and packing—these are common rather than unusual conditions in the conduct of many coöperative associations where the handling of the product is controlled by the individual members. The output of an association, therefore, acquires no stable merchandise value. The brands are not a guarantee of quality.

2. A reputation for uniformity in grading and packing can

only be acquired when the product of all of the members is handled under uniform conditions. The standardization of a product can result only from standardizing its handling, grading, and packing.

3. A uniform product can be established by having the product of the individual members handled by the members, under the supervision of the association, or for the members by the association. The former method is employed successfully in some deciduous fruit associations; the latter is the usual method in the citrus fruit associations. The conditions which lead to either method are local as well as those of the industry in question. In the citrus industry the crop is harvested over a long period of time and is comparatively non-perishable. It is possible therefore to systematize the methods of handling, to assemble the product in a central packing house, and to grade and pack it under standard rules. Without this standardization of handling, grading and packing, no coöperative association can acquire an asset in the reputation of its brands. With standardization it can acquire a reputation which makes its output sought after and for which the trade will pay a premium. A practical difficulty in handling a coöperative association lies in the fact that every member thinks that he produces a product that is the equal or superior to that of every other member. The handling of this condition is one that tests the tact of the most successful manager. It is a practical condition, however, and not a theory, and must be met with firmness, with justice and with patience by every coöperative association.

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Board of Agriculture and Forestry

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The Board of Commissioners issues for general distribution to persons in the Territory, annual reports, bulletins, circulars, copies of its rules and regulations, and other occasional papers, which may be had, free, upon application.

A complete list of the publications of the Board available for distribution (together with the titles of certain issues now out of print) is to be found on the cover of the last biennial report.

Applications for publications should be addressed to the Mailing Clerk, P. O. Box 207, Honolulu, Hawaii.

DIVISION OF HYDROGRAPHY.

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The Division of Hydrography has on hand free publications relative to the water resources of the Hawaiian Islands. These publications furnish detailed data as to daily, monthly, mean, maximum, and minimum run-off of streams and ditches, and also cuts and maps pertaining to the different islands. These publications will be mailed free of charge on request.

The records and maps of this division are available for inspection by any one who desires information relative to water resources, topography, etc. Blue print copies of hydrographic data relative to any stream, ditch, spring, etc., which may be under observation by this division will be mailed free of charge on request.

G. K. LARRISON,
Superintendent of Hydrography.

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All communications in regard to seed or trees should be addressed to David Haugh, Forest Nurseryman, Box 207, Honolulu, Hawaii.

C. S. JUDD,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent of Entomology.

THE HAWAIIAN FORESTER AGRICULTURIST

VOL. XII.

AUGUST, 1915.

No. 8

The Wood Waste Exchange of the federal department of agriculture appears to be an exceedingly important economic factor. Perhaps the workshops here using the beautiful Hawaiian hardwoods might make something out of it, therefore a press notice of the institution is elsewhere printed.

In his report for July the Territorial veterinarian explains an error in his July report, which did some injustice to both Moku-leia ranch and Pond's dairy.

Dr. Nørgaard, in reference to hog cholera, repeats in his report for June the advice of former reports with regard to feeding and sanitation as the best preventives of disease in herds of swine.

Results of the initial campaign against bovine tuberculosis on Hawaii, "the big island," are highly encouraging.

It is to be hoped that the efforts of the Territorial veterinarian to procure a visit to the Territory by the chief of the Bureau of Animal Industry, Washington, D. C., will be successful. Dr. Nørgaard's attendance at the national convention of veterinarians in Oakland this month, which has been arranged for, will do much to put Hawaii on the animal industry map of the Union as well as bring valuable returns to these islands.

Three pests were nabbed by Entomologist Ehrhorn in June, outside of various lots of contraband plants which he had either destroyed or returned. It would seem that there is no end to the ignorance, prevailing in foreign parts, of United States regulations forbidding the entrance of fruit and vegetable stuff in baggage and mails.

The new edition of Mr. Rock's book on Hawaiian forests will be awaited with keen interest here and abroad.

Results of fencing the Territorial forest reserves have been so obviously profitable that expenditures on that account must be regarded as among the soundest of investments.

That profit from forest culture is not, in these islands, a matter of legacy to future generations, but something to be enjoyed in the lifetime of the tree planter, is made evident in the article by the Superintendent of Forestry, Mr. Judd, in this number, giving the results from an ironwood grove on Kauai.

More than 10,000 plants distributed in May and June to the general public, with nearly 13,000 to plantation and other companies, by the Government nursery is "going some," but when on top of these numbers the nurseryman engages to deliver 50,000 seedlings between the middle of July and the end of August, to such corporations, a faint idea of what is doing in forestation in these islands may be gained.

Much work in June is reported by the Superintendent of Hydrography, whose division not only measures the water resources of the islands but aids in solving the water problems of plantations, municipalities and the national military establishment in the Territory.

All interested in the fruit industries of Hawaii—which must include everybody—will wish good luck to Mr. Fullaway in his search for a melon fly parasite in India.

GOOD IRONWOOD YIELD.

The following data concerning the yield of timber from a planted grove at Lihue, Kauai, may be of interest to those readers of the Forester who are engaged in tree planting:

Ironwood trees of the species known as *Casuarina quadrivalvis* were cut in April, 1915, on a plot of land a little over half an acre in area near the Lihue church, Lihue, Kauai. These had been planted in 1896 and up to the time of the final cut the plot had been thinned out several times. The cut from this plot of .6 acre was 226 trees which yielded 39 cords of firewood. At this rate the yield in wood for this species in this locality should be 65 cords per acre at the end of 19 years, which represents a growth of 3.42 cords per acre per annum. This is a better showing than available records of the yield in woodlots of blue gum, *eucalyptus globulus*, in these islands.

The wood of this ironwood is excellent for fuel and it is used extensively for this purpose in Lihue, where it now sells for \$8 per cord, delivered. The tops and branches even down to one inch in diameter, as well as the main trunk, are sold and used.

C. S. JUDD, Superintendent of Forestry.

BOARD MEETING ITEMS.

Following are items of public interest from the approved minutes of the Board of Commissioners of Agriculture and Forestry, being of a meeting held at the office of Commissioner Dowsett on July 15, at which were present Albert Waterhouse, president; H. M. von Holt and A. H. Rice, members; C. S. Judd, Executive Officer, and E. M. Ehrhorn, Superintendent of Entomology.

IMPORTATION OF FORMOSA CROW.

Mr. Muir's application of May 25 in which he requested permission to import into the Territory for liberation the Formosa crow, a bird which he considers will be beneficial, was again presented for action. The Superintendent of Entomology, upon question of the chairman, stated that he had gone into the matter to considerable extent and from all information gathered he was of the opinion that there was absolutely no danger in introducing it into the Territory. The question arose as to whether or not the bird is of a carnivorous nature and if the disease known as surra exists in Formosa. After some discussion it was thought advisable to confer with the Superintendent of Animal Industry in this regard before taking definite action. It was thereupon moved by Commissioner Rice, seconded by Commissioner von Holt and unanimously carried that Mr. Muir's application be granted subject to the approval of the Superintendent of Animal Industry.

CLAIMS FOR FIGHTING FOREST FIRE.

Chairman Waterhouse called to the attention of those present two bills dated March, 1915, which he had received from the Hilo Sugar Company, \$91.35, and from the Hawaii Mill Company, \$210.45, for labor in fighting a forest fire on the Punohoa mauka land near Hilo. After a short discussion and the Superintendent of Forestry advising that the Attorney General recommended that same be paid in accordance with Section 492 of the Revised Laws of 1915, it was moved by Commissioner von Holt, seconded by Commissioner Rice and unanimously carried, that same be approved and sent to the Auditor for payment.

APPLICATION W. F. BARTELS.

Regarding the application of W. F. Bartels dated June 7, 1915, for permission to use for agricultural purposes a parcel of land consisting of forty acres together with an allowance of pasture land within the South Kona forest reserve, Hawaii, after a short discussion and those present concurring that it would be inconsistent with the general forest reserve policy, it was unanimous-

ly voted upon motion of Commissioner von Holt, seconded by Commissioner Rice, that same be not granted, and Mr. Bartels to be so advised.

RE DAIRY LIVESTOCK INSPECTOR.

Regarding the deferred action of the Commissioners as to the reappointment of Mr. Joseph Richards in the Division of Animal Industry, the chairman read a letter from the Superintendent of that Division dated July 15, 1915, recommending that he be reappointed dairy livestock inspector at such salary as the Commissioners see fit to allow; the City and County, he advised, had appointed Mr. Richards dairy stock inspector and had appropriated the sum of \$50 per month for transportation in carrying on the work, said appointment to take effect July 16, 1915. He also advised that the Superintendent of Animal Industry had suggested that Mr. Richards be allowed a salary of \$100 per month and an extra allowance of \$25 per month for the upkeep of a horse and rig, thus allowing \$25 per month for the upkeep of the automobile on tuberculosis control work; it was thought the work could be accomplished more satisfactorily if separate transportation were provided. It was thereupon moved by Commissioner von Holt, seconded by Commissioner Rice, that beginning July 16, 1915, Mr. Richards be appointed as dairy livestock inspector of the Board at a salary of \$100 per month and an arrangement made whereby the extra allowance of \$25 per month for transportation will be made. Upon vote same was unanimously carried.

LETTER TO MAYOR LANE.

The chairman read the draft of a letter dated July, 1915, addressed to Mayor John C. Lane regarding the milk supply of the City and County of Honolulu, and advising that the Board will be glad to coöperate in every way possible with the Board of Supervisors to better conditions. Upon motion of Commissioner von Holt, seconded by Commissioner Rice, the letter as read was accepted.

RE RULE VIII, DIVISION OF ANIMAL INDUSTRY.

Chairman Waterhouse read the draft of a proposed rule of the Division of Animal Industry regarding the importation into the Territory of virus for the treatment of hog cholera. Those present concurred that said rule be submitted to the Attorney General in regard to form as well as to the legality of taking such action. Same was made a motion by Commissioner von Holt, seconded by Commissioner Rice and unanimously carried.

A communication from P. M. Pond dated July 12, 1915, re-

garding the hog cholera situation on the Island of Oahu, was presented by the chairman, Mr. Pond requesting the Board to import into the Territory virus for hog cholera treatment or draft regulations whereby it may be imported. The draft of a letter to Mr. Pond, dated July 15, was also read in which it was advised that before definite action is taken in regard to the serum simultaneous method of vaccination the Board desires to look further into the matter, and would await the results of the annual meeting of the American Veterinary Medical Association which convenes in Oakland, California, from August 30 to September 3, inclusive, at which time the subject of hog cholera and its treatment will be thoroughly discussed. Upon vote the letter as read was accepted.

RE LEAVE OF ABSENCE DR. NORGAARD.

A request dated July 15 was presented from the Superintendent of Animal Industry that he be delegated by the Board to attend the annual meeting of the American Veterinary Medical Association, also requesting the sum of \$250 for expenses. After a short discussion and those present concurring it was moved, seconded and unanimously carried that Dr. Norgaard be delegated to attend the Association meeting and that he be allowed a leave of absence of six weeks from August 17 as well as the sum of \$250 to cover expenses.

RE INCREASE IN SALARY, DAVID HAUGHS.

The Executive Officer called the attention of those present to an item in the budget for the biennial period ending June 30, 1917, allowing an increase in the salary of the Government Nurseryman of \$25 per month. Mr. Judd stated that Mr. Haughs had worked faithfully for the Board for the past several years and recommended that the increase be allowed. Upon vote the recommendation was unanimously carried.

RE LETTER OF CREDIT D. T. FULLAWAY.

Upon motion of Commissioner Rice, seconded by Commissioner von Holt and unanimously carried, the Executive Officer was authorized to arrange for a letter of credit for \$1500 in order to supply D. T. Fullaway with funds on his forthcoming trip to India in search of a parasite on the melon fly (*Dacus cucurbitae*). The Executive Officer advised that Mr. Fullaway was leaving on the 23rd inst.

DIVISION OF ANIMAL INDUSTRY.

Honolulu, June 30, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I beg to submit herewith a report on the work of the Division of Animal Industry for the month of June, 1915:

BOVINE TUBERCULOSIS.

In last month's report a mistake occurred in that Mr. Pond's dairy farm at Mokuleia was referred to as the Mokuleia ranch. As the latter belongs to the Oahu Railway & Land Company and as five cases of tuberculosis were reported to have occurred there it is but just to state that the cases in question occurred in the Pond dairy and not on the Mokuleia ranch. In justice to the dairy, however, it should be added that the same has been free of tuberculosis for a long time and that the cases in question resulted from an unfortunate mistake in introducing new stock which erroneously was supposed to have been tested by this office. The reacting animals were removed from the premises at once. With the exception of a few family cows no tuberculin testing was done during the month of June.

HOG CHOLERA.

The two outbreaks of hog cholera which occurred during May were brought well under control by means of the serum treatment and so far as is known the disease remained confined to these two herds. An effort is now being made to ascertain what truth there may be in certain rumors to the effect that the disease has occurred in various other localities on Oahu. This, however, is no easy matter owing to the reluctance on the part of many owners, especially among the Orientals, to admit losses of live stock or the presence of disease among them. When to this is added that the symptoms of swill poisoning often resemble those of hog cholera sufficiently to puzzle the veterinarian, and with immense quantities of swill being fed on Oahu, it becomes exceedingly difficult to gain any definite information beyond the fact that wherever swill is fed losses will occur, the extent of which cannot always be said to have any direct relation to care and sanitation, but which probably can be controlled in most cases by varying the swill diet with other feeds and good pasturage. Hog raising on a large scale has been an unknown industry here until quite recently and has to a great extent been in the hands of the Oriental population. In other countries it has long been realized that while there are large profits and quick returns there are also exceedingly great risks in bringing together large numbers of hogs, and that these risks are multiplied

when swill constitutes the main feed. So far as I have been able to ascertain no hog cholera or any other disease of an endemic nature has occurred here among hogs fed in a rational way, that is, corn or other grain, roots and field crops, especially alfalfa, and when kept under sanitary conditions with access to pasture and plenty of fresh water. On the Parker ranch for instance hundreds of hogs are raised annually without losses worth mentioning. To assume that any form of serum or other treatment can take the place of sanitation and experience or can balance a one-sided ration is fallacious, but where losses are due to infection from disease-producing bacteria much can undoubtedly be gained by judicious treatment. Nor can it be gainsaid that hog raising methods have been revolutionized on the mainland of the United States since the general use of anti-hog cholera serum has so effectively reduced the animal losses from this disease and given an impetus to hog raising never known before.

VETERINARY CONVENTION IN OAKLAND, CAL.

The success of this new treatment is due almost exclusively to scientists of the federal Bureau of Animal Industry and to the state livestock sanitary officials as well as the practicing veterinarians of the United States. It is estimated that nearly one thousand of these official and private veterinarians will meet in Oakland, California, the latter part of August this year, for the purpose of exchanging ideas and experience relative to the control and suppression of infectious and contagious diseases among live stock, and with a view to the ultimate eradication of such scourges as bovine tuberculosis, hog cholera, rabies, Texas fever and foot and mouth disease. The value of such an opportunity to exchange ideas and come in direct communication with men of great experience on the subjects which are confronting us here in Hawaii cannot be overestimated, and the writer takes the opportunity herewith to thank the Board for delegating him to attend the 53rd annual convention of the American Veterinary Medical Association in Oakland next month.

While the hog cholera serum which has been used here up to the present time may have been everything that could be expected, an opportunity will also be afforded at this meeting to learn which of the more than ninety authorized manufacturers produce the most reliable serum. More than \$60,000 worth of spurious or inferior serum has been confiscated by federal inspectors, and it is not impossible that the quantity which reached Hawaii has not all been of the best. Some of it at least has been decidedly foul smelling when opened and much of it has contained so much sediment as to make it difficult of administration. It may be taken for granted that every manufacturer of serum will have an exhibit at or near the convention hall and that unpreju-

diced opinions as to their relative values may be obtained from friends and colleagues among the federal and state officials present.

Uniform rules and regulations for the inspection and testing of live stock in interstate traffic as well as for methods of dealing with outbreaks of infectious diseases in general and with bovine tuberculosis in special are among the other subjects of interest to this Territory which will come up for discussion.

An effort to induce the chief of the Bureau of Animal Industry or one of his divisional chiefs to visit this Territory in person, and preferably as soon as the Oakland convention has adjourned, is already under way and will, if successful, be of value to the various branches of the local live stock industry not alone on account of the expert advice and suggestions he may be able to offer, but also in imparting to an influential federal official an opportunity for personal observations on live stock conditions in this isolated island possession of the United States and its ability to care for itself under possible future world complications.

TRANSPORTATION OF LIVE STOCK.

The following live stock arrived at the port of Honolulu during the month of June:

June 1—S. S. Lurline: 9 horses, 20 mules, 22 cattle, 1 hog, 19 crates poultry.

June 8—S. S. Wilhelmina: 22 crates poultry.

June 15—S. S. Manoa: 9 hogs, 18 crates poultry.

June 22—S. S. Matsonia: 3 dogs, 31 crates poultry..

June 25—S. S. Makura: 1 dog.

June 28—S. S. Sierra: 36 crates poultry.

June 29—S. S. Lurline: 6 crates poultry.

From the island of Hawaii the Assistant Territorial Veterinarian reports having tested 158 head of cattle belonging to 51 owners. Of this number two stables were found infected with respectively three and two reactors.. This condition must be said to be highly favorable to the speedy eradication of tuberculosis on the big island.

No cases of hog cholera have come to notice during the past three months on either Hawaii or Maui.

Respectfully submitted,

VICTOR A. NORGAARD,
Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

Honolulu, June 30, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the work performed by the Division of Entomology for the month of June, 1915, as follows:

During the month 59 vessels arrived at the port of Honolulu of which 24 carried vegetable matter and two vessels carried moulding sand. Of these vessels eight came via the Panama Canal.

<i>Disposal.</i>	<i>Lots.</i>	<i>Parcels.</i>
Passed as free from pests.....	1,122	18,864
Fumigated	2	2
Burned	38	38
Returned	1	1
Total inspected.....	1,163	18,905

Of these shipments 18,674 packages arrived as freight, 103 packages as mail matter and 128 packages as baggage of passengers and immigrants.

RICE AND BEAN SHIPMENTS.

During the month 24,977 bags of Japanese rice, 76 bags of Chinese rice, 1996 bags of Japanese beans and 193 bags of sorghum seed arrived, and after a thorough inspection were found free from rice, bean and grain pests and all shipments were allowed to be delivered.

PESTS INTERCEPTED.

Nineteen packages of fruit and seven packages of vegetables, also six packages of plants, were taken from the baggage of passengers and immigrants from foreign countries and destroyed by burning. The plants were destroyed under the rules of the Federal Horticultural Board on account of not having the required permits of entry. A package of beans from Spain was found infested with the common bean weevil and was fumigated before delivery. A package of algaroba beans from Manila was infested with the larvae of some weevil, and was fumigated before delivery. A juniper plant was taken from its container and all soil removed and after replanting same in sterilized soil was allowed to pass. One package of hibiscus cuttings from the Philippines was intercepted at the postoffice and was returned to the shipper as unmailable under the rules of the Federal Horticultural Board.

BENEFICIAL INSECTS.

Owing to Mr. D. T. Fullaway's absence during the month of June the work of breeding and distributing parasites of the fruit fly and horn fly was carried on by the assistant in the insectary. Mr. Fullaway kindly assisted in a general way as adviser, and the following parasites were reared and distributed during the month:

Bred—*Tetrastichus*, 24,510; *F. fullawayi*, 1,123; *D. tryoni*, 644; *African spalangia*, 4,000; 30,277. Other species, 5,000. Total bred, 35,277.

Liberated—*Tetrastichus*, 24,300; *D. fullawayi*, 1,162; *D. tryoni*, 646; *African spalangia*, 2,000; *Opius humilis*, 200; *Philippine spalangia*, 2,500; *Philippine pteromalid*, 1,100; *Hornfly*, *African*, 1,200; total liberated, 33,108.

In producing these parasites there were used a total of 44,200 pupae.

HILO INSPECTION.

Owing to the usual leave granted Brother M. Newell at this season of the year I sent Mr. D. B. Kuhns to Hilo to supervise the work there during Brother Newell's absence. Ten steamers arrived at the port of Hilo of which five brought vegetable matter consisting of 184 lots and 2904 packages. The T. K. K. steamer Keiyo Maru arrived direct from Japan with 3000 bags of rice and 346 bags of beans, all of which was passed as free from pests.

INTER-ISLAND INSPECTION.

During the month of June 64 steamers plying between Honolulu and the ports of the other Islands were attended to. The following shipments were passed: Plants, 108 packages; taro, 458 bags; vegetables, 57 packages; fruits, 3 packages; total inspected, 626.

The following packages were refused shipment on account of infestation or of having soil attached to the plants: Plants, 15 packages; fruit, 18 packages; total refused, 23 packages.

Respectfully submitted,

E. M. FERRIS,
Superintendent of Entomology.

DIVISION OF FORESTRY.

Honolulu, July 13, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit the following routine report for the Division of Forestry for the month of June, 1915:

MOLOKAI TRIP.

During the first week of June I was on Molokai finishing up the work of which I wrote in my May routine report.

FENCE WIRE.

On June 7, bids for furnishing 520 coils of No. 6 gauge American Special extra heavy coated galvanized fence wire were opened, and were as follows:

Theo. H. Davies & Co., Ltd.....	\$3.52 per coil.
Fred L. Waldron, Ltd.....	3.74 “
Inter-Island Steam Nav. Co., Ltd.....	3.75 “

The lowest bid was accepted and contract and bond calling for delivery of 150 coils by June 24 and the balance by August 10, 1915, and involving a total payment of \$1830.40, to come out of the appropriation for the period ending June 30, 1915, were executed and approved.

GRASS CUTTING.

An application to cut grass in the reserve on Tantalus was refused on the same grounds that similar requests in the past were not granted—the objection of residents of Tantalus to the damage done to the roads by the grass wagons and the need of the grass for fire protection.

USE OF LAND.

An application was received for the use of about 40 acres of land in a kipuka within the South Kona reserve, Hawaii. In a special report on this application I have recommended that it be not granted on the grounds that it would be inconsistent with our forest reserve policy.

MANUSCRIPT FOR BULLETIN.

Consulting Botanist Joseph F. Rock has revised and submitted his manuscript on “The Forests of the Hawaiian Islands,” being a description of the forest covering of each of the eight principal

islands. As soon as possible I plan to go over this carefully and recommend to the Board as to its publication as a bulletin of this Division.

During the last half of the month, to my regret, I was obliged to be absent from the office on account of ill health.

* Respectfully submitted,

C. S. JUDD,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, July 14, 1915.

C. S. Judd, Superintendent of Forestry.

Dear Sir:—I herewith submit a report of the principal work done during the month of June:

NURSERY.

Distribution of Plants.

	In seed boxes.	In boxes trans- planted.	Pot grown.	Total.
Sold . . . . .	....	150	236	386
Gratis	3000	1800	1082	5882
	<hr/> 3000	<hr/> 1950	<hr/> 1318	<hr/> 6268

GOVERNMENT REALIZATIONS.

Collections.

Collections on account of plants sold amounted to	\$ 7.45
Rent of building, Nursery grounds	35.00
	<hr/> \$42.45

PRESERVATION FOREST RESERVES.

Rent of premises at Half-Way House, Tantalus, for April, May and June, 1915	\$30.00
For use of two acres of land, Kalawahine in Pauoa valley, for April, May and June	5.00
For use of land and gathering ti leaf on Kalawahine, Pauoa valley, for April, May and June	12.50
	<hr/> \$47.50

PLANTATION COMPANIES AND OTHER CORPORATIONS.

Under this heading 9000 trees in seed boxes and 300 in transplant boxes, have been distributed during the month. An order for 50,000 seedlings has been received from one plantation. These will be delivered within the next six weeks.

MAIKI STATION.

The work at this station has been principally routine; namely, mixing and sterilizing soil, transplanting and potting plants, etc.

HONOLULU WATERSHED PLANTING.

During the month 864 kukui trees were planted out. Other work done consisted of hoeing and clearing away grass and weeds from the young trees recently planted.

Very respectfully,

DAVID HAUGHS,
Forest Nurseryman.

 DIVISION OF HYDROGRAPHY.

Honolulu, July 9, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the Division of Hydrography during June, 1915, is submitted:

WEATHER CONDITIONS.

With the exception of the Hilo district on Hawaii and the Ewa district of Oahu, the rainfall was only slightly below normal throughout the islands. Both Hilo on Hawaii and Ewa on Oahu districts have suffered from drought, while practically all of Maui and Kauai have had abundant light showers throughout the month. Waianae on Oahu suffered from drought during the early part of the month, but this was broken the last of the month. Heavy rains fell on East Maui and over the most of Hawaii during the week ending June 26.

The rainfall of the upper Nuuanu valley has kept Reservoirs No. 1, 2 and 3 full, and No. 4 has held its own with a depth of about thirty feet.

LEGAL WORK.

The Superintendent assisted the Attorney-General's office during the entire month by collecting, computing and segregating hydrometric and level data relative to the Waikoloa water case being tried at Kamuela, Waimea, Hawaii.

SCHOFIELD BARRACKS WATER SUPPLY.

In compliance with a request from the commanding officer, Hawaiian Department, U. S. Army, a report with recommendations relative to the present and future water supply of Schofield Barracks was completed and has been forwarded. .

KAUAI.

A large amount of small repair and maintenance work was completed; old staff gages were replaced by new enameled gage faces; and a new measurement station was established on the Kaholalele ditch which diverts water from the North Wailua river, just above Kaholalele falls.. This ditch now loses about half its flow by seepage in the first half mile.

Sixty-two stream and ditch measurements were made, and five rainfall stations were visited.

OAHU.

A large amount of maintenance work was done and all stations on the island were visited. Thirty-one stream and ditch measurements were made, and four rainfall stations were visited.

The discharge from the north portal of the Waiahole tunnel was measured and found to total twenty-four million gallons per day—a decrease of about four million gallons in about a month.

MAUI.

All continuous record, or clock register stations, were visited and twenty-two stream measurements were made. Two rainfall measurement stations were visited.

HAWAII

Eight stream and ditch measurements were made on the Waikoloa stream and the Lyons ditch; a large amount of ditch levels were run; and a large amount of hydraulic computing work was completed for the Attorney-General's department, at Waimea.

JULY PLANS.

Kauai.—Most of the month will be spent in collecting and preparing Kauai stream and ditch discharge and rainfall data for the fiscal year ending June 30, 1915.

Three Gurley water stage registers have been ordered for installation, probably in August and September, on the three main branches of the Waimea river. The registers, when established, will furnish records of the entire flow of the upper Waimea drainage at points above all ditch intakes. A ditch measurement station will be re-established on the Kekaha ditch during the month of July.

Oahu.—Only routine field and maintenance work will be done, as the entire force on the island will be occupied in preparing data for the report of the past fiscal year.. A field trip to all windward Oahu stations will be made, and such low water measurements will be made as are needed to bring rating curves up to date.

Maui.—Only routine work will be done. All private ditch discharge and rainfall records for the past year which are available will be collected.

Hawaii.—No operations on this island are planned.

Very respectfully,

G. K. LARRISON,
Superintendent of Hydrography.

FOREST EXHIBIT FOR CALIFORNIA.

Part of the government's exhibit for the Panama-California Exposition at San Diego left Washington recently. This portion has to do with the national forests of New Mexico, and will be shown in the New Mexico building, the exhibit having been prepared in coöperation with the state board of exposition commissioners of that state. The material also shows specimens of the principal timber trees of New Mexico and their uses.

Other exposition material was to leave soon for San Francisco, where it will form a part of the Panama-Pacific Exposition. Part of this is being prepared through coöperation between the forest service and the United States civil service commission. The commission passes on the qualifications of all candidates for positions in the forest service, testing the fitness of those who wish to become forest officers through outdoor examinations in riding, surveying, timber estimating, and similar matters, as well as by more conventional methods. Its exhibit will illustrate the duties of these officers.

Coöperation also exists, in the preparation of exhibit material, between the forest service and the bureau of education. This shows how forest subjects are used in the public schools, in con-

nection with nature study, commercial geography, agriculture, and the like. One of the exhibits is a display made by the normal school pupils of the District of Columbia, in which a number of those who are studying for teachers' positions entered a prize contest on tree study. Each of the contestants prepared a separate exhibit showing the life history and the products of individual trees, such as white pine, hickory, or sugar maple.

POTATO SPRAYING.

Following are the conclusions of bulletin No. 397 of the New York agricultural experiment station, Geneva, N. Y., on "Lime-sulphur vs. Bordeaux Mixture as a Spray for Potatoes," the author being M. T. Munn:

"The results of the past two seasons' work are entirely confirmatory of the experiments of the previous two seasons. The relative efficiency of the two sprays, as far as their effect upon potato foliage and tuber yield is concerned, can be definitely stated. Bordeaux mixture, because of its beneficial influence upon the leaves, materially lengthens the productive life of the potato plants resulting in a marked increase in yield of tubers. The lime-sulphur solution, because of its injurious effect in dwarfing the plants and aggravating tip-burn, causes the plants to die ten days to two weeks earlier than those in unsprayed rows and materially decreases the yield of tubers.

"The effect of lime-sulphur on late blight and rot (*Phytophthora infestans*) is still uncertain, since it appeared in the experimental field in but one of four seasons' tests at which time it apparently failed to check the disease.

"It seems certain, then, that lime-sulphur should not be used as a potato spray, while on the other hand it pays to spray potatoes every season with bordeaux mixture, because the bordeaux mixture prevents tip-burn, prolongs the life of the plants, and increases the yield in dry seasons, while in wet seasons the protection against late blight, with its resulting tuber rot, may result in marked gains. Potato growers should not omit the spraying of potatoes with bordeaux mixture."

AN AMERICAN SUGAR-PLUM.

\$200,000,000 was the size of this sugar-plum in 1909, according to reliable statistics, says Harry R. Lewis, author of "Productive Poultry Husbandry," published by J. B. Lippincott Company. All that tidy sum for what? Just for hen's eggs. (The sale of chickens not included.) It was divided up among a good many Americans, yet the bulk of it went to people living in Iowa, Missouri, Illinois, Ohio, New York, Indiana, Pennsylvania, Kansas, Michigan and Texas. It certainly must have gone a good way toward meeting the high cost of living for them. A good

many other Americans would have been glad to share in that plum—and by the way, why don't they? Read Professor Lewis for the "how to do it." He is poultry husbandryman in the New Jersey agricultural experiment station, and knows all there is to know about it.

*"I KNOW A BANK WHEREON THE WILD THYME
GROWS."*

There is a woman who so loved the flower descriptions in Shakespeare's plays and poems that she devoted a sunny garden space to all the dear, fragrant blossoms celebrated in his immortal verse. Lovely indeed was that garden, and redolent of poesy as well as flower scents. Yet who shall say that our own fair land, with its wild cyclamens, Mariposa lilies, wild forget-me-nots, scarlet sage, and hundreds of other rare blossoms, could not outvie all the blossoms that Shakespeare knew? Those who walk abroad under the happy guidance of George Lincoln Walton's "Flower Finder," (Lippincott) need no Latin and less Greek to identify every flower that blooms by stream, hillside or wayside, and find in their friendly recognition all the tender charm expressed in Shakespeare's poetry.

*SWEET POTATO AND COWPEA VINES AS FEED FOR
STOCK.*

Some investigations have been made in Japan, and reported on in the Journal of the Department of Agriculture of Victoria, which seem to show that the dried vine of the sweet potato affords an excellent fodder for live-stock. In discussing the work it is said that the aggregate weight of stem and leaves per hectare is 13 tons. The green vine is considered rather a watery food resembling in composition the leaves of the sugar beet, containing tannin, however, instead of oxalic acid. Although this green stuff may with caution be fed as such, it is the dried material which has proved more satisfactory. In the experiments, the stems and leaves were exposed to the sun for a few days, but at a temperature much lower than occurs in the tropics, and eventually an air-dried herb was obtained with a fine aroma, which was gladly eaten by stock. The green vines and leaves of the sweet potato were also shown to serve as useful material for the manufacture of ensilage. Animals fed on this material thrived satisfactorily. Although it is observed that there was a loss in nutritive material during its manufacture into ensilage, this amounted only to about 6 per cent.

In another publication (Tropical Life for April 1915) attention is given to the value of cowpea vine as a cattle feed. After referring to the great value of this material as a nitrogenous fertilizer and weed destroyer, it is stated that cows getting cow-

pea hay averaged 1.3 pounds more milk daily than those which were fed on wheat bran. For pig raising it is said that cowpea vines are invaluable. Experiments made in New Zealand with three 50 pound pigs in a field pasture of cowpeas, given corn additional, and the second lot of three fed on corn only, in a trial lasting forty-two days, showed that the pigs in the cowpea field gained nearly three times as much as those fed on corn alone. In a trial made with this fodder on horses, it was proved that cowpea hay combined with corn and cob meal made a very satisfactory work ration. Cowpea hay with a reasonable quantity of corn is regarded as a good substitute for bran and oats.—Agricultural News.

WORLD CHAMPION AYRSHIRE.

Henderson's Dairy Gem 35175, bred by Hill Top Farm, Wheeling, W. Va., owned by Henderson's Dairy Farm, Hudson, O., has completed her year's test for advanced registry with the official record as a senior two-year-old of 17,974 lbs. of milk, 738.32 lbs. of fat, 4.11% fat, making her the senior Ayrshire two-year-old champion of the world.

This record is an interesting study in breeding for a purpose, whether it was done by accident or design, I cannot say, but it illustrates what we have always claimed, that when Ayrshires that had proved themselves producers were coupled we might expect phenomenal records. The sire of this heifer is Rena's Champion, a young bull with two advanced registry daughters already to his credit; his sire is Finlayston with 39 advanced registry daughters to his credit. The dam of Rena's Champion is Rena Ross with an official record of 15,072 lbs. of milk, 462.86 lbs. of fat, 4.26% fat. The dam of Henderson's Dairy Gem is Dairy Gem, with a three-year-old record of 14,425 lbs. of milk, 533.55 lbs. of fat, 3.7% fat. She was sired by Howie's Dairy King, with 20 daughters to his credit, out of Drummond's Gem, with an official record of 10,841 lbs. of milk 388.60 fat, 3.58% fat.

The above illustrates the value of advanced registry work with any breed of dairy cattle, and should be an incentive to Ayrshire breeders to breed by method not by chance.

C. M. WINSLOW,

Secretary Ayrshire Breeders' Association.
Brandon, Vermont.

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Board of Agriculture and Forestry

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A complete list of the publications of the Board available for distribution (together with the titles of certain issues now out of print) is to be found on the cover of the last biennial report.

Applications for publications should be addressed to the Mailing Clerk, P. O. Box 207, Honolulu, Hawaii.

DIVISION OF HYDROGRAPHY.

Rooms 17-22 Kapiolani Bldg. Tel. No. 3662.

The Division of Hydrography has on hand free publications relative to the water resources of the Hawaiian Islands. These publications furnish detailed data as to daily, monthly, mean, maximum, and minimum run-off of streams and ditches, and also cuts and maps pertaining to the different islands. These publications will be mailed free of charge on request.

The records and maps of this division are available for inspection by any one who desires information relative to water resources, topography, etc. Blue print copies of hydrographic data relative to any stream, ditch, spring, etc., which may be under observation by this division will be mailed free of charge on request.

G. K. LARRISON,
Superintendent of Hydrography.

VOL. XII.

SEPTEMBER, 1915

No. 9

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DIVISION OF FORESTRY.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Alizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haug's, Forest Nurseryman, Box 207, Honolulu, Hawaii.

C. S. JUDD,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent of Entomology.

THE HAWAIIAN FORESTER AGRICULTURIST

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FOREST FIRE PREVENTION.

From the federal forest service branch at Portland, Ore., comes the following condensed information and advice regarding the mischief of forest fires and the means of preventing them:

Forest fires are unnecessary, are nearly always the result of carelessness, and may wipe out in an hour what nature has taken years to create.

They destroy existing forests.

They destroy young growth, which means future forests.

They destroy the beauty of the region.

They destroy a great market for labor.

They destroy prosperity.

They destroy homes.

They destroy lives.

Forest fires can be prevented by:

Never leaving a camp fire until it is out;

Never making a camp fire in leaves, rotten wood or against a log;

Never tossing away burning matches or tobacco;

Never burning brush, grass or slashings during a dry season.

NOTES FROM CALIFORNIA.

Some interesting items, in view of the activities of our Board of Agriculture, appear in a late issue of the Clovis Tribune, of Fresno county, Cal. We note that, in a test of dairy cows, "it is reported that Laton herds are affected with tuberculosis to the extent of 30 per cent." Another item gives, as one of several reasons for a tremendous fall in the demand for milch cows, "the inauguration of the new sanitary law requiring examination as to health, etc." Then comes the following bad news about hog cholera:

"The much dreaded hog cholera is spreading at an alarming rate in the county. Over 100 hogs died in one herd, last week, and were burned, and the sale of pork has fallen off over half in consequence, as the disease is communicable to man and is almost always fatal. It is hard to detect it in a herd until the disease has been firmly intrenched and it is hard to eradicate."

There are different items presaging material advances in the prices of hay and other stock feed the coming winter, which ought to strengthen the Hawaiian campaign for home-grown products of this kind.

Hawaii has been favored, the past month, with a brief visit from Dr. L. O. Howard, chief of the bureau of entomology, U. S. department of agriculture, Washington, D. C. After looking over the work of the Hawaii agricultural experiment station, he spoke hopefully to a pressman regarding the results to be expected from the investigations, conducted there for the past two years, into the life and habits of the fruit fly and the pink cotton-boll worm. Dr. Howard expressed great satisfaction with the manner in which the division of entomology, of the territorial board, is being conducted. Besides the federal experiment station, he visited that of the sugar planters. Shortly before leaving for Washington he said he was filled with enthusiasm at the beauties of the islands and their agricultural possibilities, and predicted that Hawaii would attract by the tens of thousands middle-aged people looking for an ideal winter resort. Agricultural problems here were being handled in a very efficient way, the noted entomologist remarked, adding, "The board of agriculture and forestry is doing the most intelligent work possible."

"The Loquat," a semi-tropical fruit "that has not shown itself particular as to soil conditions" in California, is the subject of Bulletin No. 250 of the University of California (Berkeley) publications. It appears to be a fairly exhaustive brochure and may be commended to the attention of Hawaiian small farmers and homesteaders.

Mr. Hannestad's letter in this number, on the success attending eucalyptus tree growing on Maui, is interesting and instructive.

The India Rubber World gives estimates to show that the rubber production of 1915 will be about the same as that of last year, which was in round numbers 121,000 tons. Referring to Brazil as "the unknown factor," the World says: "Notwithstanding an extraordinary fluctuating market, South America during the past eight years has been a wonderfully uniform producer. Neither the high prices of the boom period nor the subsequent slump seems to have had much influence upon the outturn of Brazil."

Executive Officer Judd has an official notice in this number relating to brush fires on the Tantalus ridge, Honolulu watershed forest reserve.

Rule VIII of rules and regulations of the Board of Commissioners of Agriculture and Forestry, being for the purpose of preventing the further spread of hog cholera within the Territory, is promulgated in this number under the signed approval of Governor Pinkham. It prohibits the introduction of hog cholera virus excepting with the written permission of the Board.

DIVISION OF ANIMAL INDUSTRY.

Honolulu, August 16, 1915.

Board of Commissioners of Agriculture and Forestry.

GENTLEMEN:—I beg to report on the work of the Division of Animal Industry for the month of July, 1915, as follows:

HOG CHOLERA.

In regard to the continued prevalence of hog cholera in the city and county of Honolulu I have to state that diligent inquiry at most of the piggeries in and around the city has shown that the disease is causing but very slight losses, and those principally among young pigs. Further, that it is very doubtful whether these losses are due to actual hog cholera infection and not to faulty feeding and lack of sanitation. In the Kapahulu district, for instance, small pigs are lost from time to time in certain piggeries where the serum treatment is used regularly, while none are lost or even affected in neighboring piggeries where no treatment or preventive measures outside of cleanliness are resorted to. These observations have confirmed my belief that rational sanitary measures and knowledge of feeds and feeding are required far more than serum and virus to make hog raising the success it ought to be here. That the preventive treatment is of great value cannot be questioned, and its use in piggeries where swill is fed may prove profitable, even where hog cholera is known to be present, the serum treatment, so to speak, taking the place of cleanliness and sanitation; but it is an expensive and uncertain way of guarding against disease, and it certainly will not save any of the young pigs that are now being lost on account of faulty care and feeding of the brood sows.

On the two large hog ranches where the disease prevailed during May and June the serum treatment appears to have done everything that could have been expected from it, and no losses have occurred among the several hundred young hogs imported from Oregon last month, and which were serum treated and

exposed to the infection which undoubtedly still lingered on Mr. Pond's place.

On July 27 the Governor approved Rule VIII of this division, which forbids the introduction of hog cholera virus without special permission from this board. While this measure might have seemed superfluous so long as the federal Bureau of Animal Industry had already forbidden the shipment of the virus in interstate trade, it was nevertheless deemed advisable to follow the lead of numerous other states and territories where similar regulations have been promulgated. The principal effect of this rule would therefore be to prevent a resident of or a visitor to this Territory from bringing the virus with him when returning to or arriving in Hawaii from the mainland, whereas it is held the federal regulation applies only to its unauthorized introduction by a public carrier.

BOVINE TUBERCULOSIS CONTROL WORK.

The testing of the dairy cattle of Honolulu for tuberculosis was resumed during the last week of July and, as was expected, some very high percentages were met with in those dairies where no testing had been done for sixteen months or more. On the other hand, it was very gratifying to find a number of dairies absolutely free from the disease, while several of those which have submitted their herds to regular tests have only a single animal affected. It is, however, too early to draw any conclusions as to the ultimate result, except to say that the percentage of reactors most likely will exceed that of last year. On the other hand, the results are encouraging in so far as they show conclusively that the milk producer who actually desires to get rid of the disease can do so, and can with very little care maintain his herd clean—at least so long as his neighbors do the same.

It is, of course, to be regretted that the indemnification bill which was introduced before the last legislature, at the instigation of this board, failed of passage, but as nobody is to blame except the dairymen themselves, it is only to be hoped that this just measure will meet with better understanding and support in 1917. In the meantime the coöperation which has now been established with the municipal sanitary authorities cannot fail to be of benefit to the dairy industry, and will undoubtedly have telling effect upon the wholesomeness of the local milk supply. The moral and monetary support of the Board of Supervisors and the reappointment of Mr. Joseph Richards as dairy live stock inspector have convinced the milk producers and dealers of the earnestness of the public in the demand for clean milk from healthy cows; and while the ultimate end—that is, the complete eradication of bovine tuberculosis unquestionably received a setback of perhaps a year through the opposition engendered during the last legislative session, the cost of the setback, it is

hoped, will prove an incentive to those responsible for it, not to let it occur again. The disease could and should have been stamped out with the end of this year, whereas it will now require two or maybe three more tests before the last case is located and disposed of. This applies, of course, only to this island and to the herds that are not already clean or nearly so.

IMPORTATION OF DOGS.

Another attempt at landing a dog from a steamer coming from San Francisco, without submitting it to inspection and quarantine, occurred in July. The dog was carried ashore in a basket, but was quickly apprehended and before it had been in contact with other dogs. As the explanation furnished by the ship's officers seemed reasonable—the dog being brought ashore while the inspecting officer was in the purser's office and the guard at the gangplank having seen him go on board took the inspection and permit to land for granted—no further action was taken in the matter.

In regard to the length of the quarantine period it is worthy of mention that England, since November, 1914, has reduced the period from six months to four, the same as has been in effect here for the past four or five years, and which seems to be sufficient for safety. A slight increase in the number of dogs arriving has been noted of late.

VETERINARY MEETING IN OAKLAND, CAL.

On August 17 the writer will, as authorized by this board, leave by the S. S. Manoa for San Francisco in order to attend the annual meeting of the American Veterinary Medical Association which convenes at Hotel Oakland, in Oakland, California, on August 30. At the meeting the live stock sanitarians and veterinary officers from nearly all the states in the Union will discuss such subjects as hog cholera, bovine tuberculosis, foot and mouth disease, rabies and many others.

An invitation has been extended by Governor Pinkham to the Secretary of Agriculture, the Hon. D. F. Houston, to have the chief of the Bureau of Animal Industry, Dr. A. D. Melvin, pay a visit to this Territory on completion of the meeting in Oakland. The Governor's letter, a copy of which is appended, is self-explanatory and went forward on August 10.

The writer will present a synopsis of the work done in this Territory, for the past ten years, and especially with regard to the control or suppression of bovine tuberculosis, and will endeavor to gather all possible information in regard to the latest and most approved methods of dealing with hog cholera and other infectious animal diseases.

In case Dr. Melvin should decide to return with me to Hono-

lulu, it is expected that we will arrive here by the Matsonia on September 14.

Very respectfully,

VICTOR A. NORGAARD,
Territorial Veterinarian.

THE GOVERNOR'S LETTER.

Executive Chamber, Honolulu, Hawaii,
August 10, 1915.

Hon. D. F. Houston, Secretary of Agriculture, Washington,
D. C.

DEAR SIR: On behalf of the Board of Commissioners of Agriculture and Forestry of the Territory of Hawaii I have the honor herewith to request that the Chief of your Bureau of Animal Industry, Dr. A. D. Melvin, be delegated to visit this Territory in the near future in order to secure for that board expert advice and information in regard to the present status of our live stock industry with a view to its further development.

While this Territory must be said to be remarkably free from infectious and contagious diseases of live stock—neither anthrax, Texas fever, rabies, blackleg nor glanders existing here, and bovine tuberculosis, with which work the said board has now remain problems which an uninfluenced mind might solve more readily than one constantly impressed by local conditions. Among these problems might be mentioned the control and eradication of bovine tuberculosis, with which work the said board has now been engaged for more than five years, the results showing a reduction of bovine tuberculosis on the Island of Oahu from nearly 30 per cent to a fraction more than 2 per cent, while the local Board of Health records show a corresponding decrease in cases of tuberculosis in children under five years of age. An aggregate of about 1300 head of tuberculosis cattle have been destroyed, the owners receiving no compensation except that resulting from an increase in price of the market milk.

This system, which appears extremely simple, is based on the public demand for clean milk from healthy cows only, and is unsupported by stringent laws, rules and regulations, or by any appropriation beyond the usual salaries of the same number of territorial and municipal officers as were employed before the eradication of bovine tuberculosis was decided upon. It is fully believed that this system can be carried through successfully in any state, county or community where the local veterinarians, whether sanitary officials or private practitioners, can secure the support and coöperation of the local board of health, the municipal or county sanitary officials and the medical fraternity or association. This work has been in direct charge of Dr. V. A. Norgaard, who for many years was connected with your Bureau

of Animal Industry. Dr. Norgaard has been delegated to attend the American Veterinary Medical Association's meeting in Oakland, California, August 30 to September 3, this year, where he will read a paper on this subject, and where he hopes to meet and interest Dr. Melvin in the extension of this system to other parts of the United States.

Another problem confronting us here is the question as to the advisability of allowing the use of the serum-simultaneous treatment for hog cholera within the Territory.

Two of the largest hog raisers here have come to the conclusion that the serum alone treatment is not satisfactory and claim to have suffered heavy losses for want of permission to introduce and use the virus here. A regulation recently promulgated by the Board of Agriculture and Forestry forbids the introduction of hog cholera virus without special permission, and the question, whether such permission would be to the best interests of everybody concerned, in an isolated territory where the introduction of fresh infection from abroad can be most effectively controlled, and where the disease has always shown a strong tendency to attenuation in virulence, is one which has also actuated the said board to send Dr. Norgaard to the Oakland meeting, for elucidation. His main object will, however, be to meet Dr. Melvin, whom he confidently expects will be there, and in case you, Mr. Secretary, should decide to send him on a tour of inspection to this Territory, to accompany him and assist him in every way possible to make this trip as pleasant and as profitable to all concerned as possible.

Another matter which at any time may become of paramount interest is the food supply of the Territory, which, as you are aware, falls far short of what is required without constant importations, not alone of flour and cereals, but likewise of most meat food products and practically all dairy products.

The question of supporting 200,000 inhabitants besides at present 9600 and prospectively 15,000 or more officers and soldiers for any lengthy period, in case of total or partial isolation, would therefore seem to be one that merits consideration, and one for which Dr. Melvin might possibly be able to suggest measures, at least in so far as the live stock industry is concerned.

It is therefore earnestly desired that this Territory be allowed the benefit of Dr. Melvin's long experience and that you, Mr. Secretary, will authorize him to spend a couple of weeks with us immediately after the adjournment of the Oakland veterinary meeting.

Very respectfully,

LUCIUS E. PINKHAM,
Governor of Hawaii.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, July 31, 1915.

Dr. Victor A. Norgaard, Chief of Division of Animal Industry.

SIR:—I have the honor to submit the following reports for the months of June and July:

•
June.

Tuberculosis Control.

Work under this head was confined to the testing of 13 head of Holstein cattle brought down from the Parker Ranch by Mr. Isenberg. All passed the test.

Hog Cholera.

Ten trips of inspection were made as follows: Four to the Lucas and Bellina ranches at Niu and Kuliouou; five to Pond pig farm beyond Schofield Barracks, and one trip to inspect the Railroad ranch's pigs at Nanakuli. At the last-mentioned place hog cholera has never existed, and the animals were found in a healthy and very lively condition.

The cholera situation on Bellina's and Pond's ranches appears to be much improved, and we may say that these two outbreaks are now under control. While there is still plenty of room for improvement in sanitation, the health of the animals is considerably improved and all loss from cholera seems to be at an end.

Importations of Live Stock.

S. S. Lurline, San Francisco: 1 Berkshire boar, College of Hawaii; 23 Holstein cows, 2 horses, C. W. Lucas; 7 horses, U. S. Q. M. Dept.; 20 mules, Schuman Carriage Co.; 7 crates poultry, Barrere Sales Company.

S. S. Wilhelmina, San Francisco: 22 crates poultry; 1 crate rabbits, W. F. X. Company.

S. S. Manoa, San Francisco: 6 Berkshire boars, 3 sows, E. O. Hall & Son; 18 crates poultry.

S. S. Matsonia, San Francisco: 1 dog, H. L. Withers; 2 dogs, H. L. Morris; 2 birds, S. Robinson; 1 parrot, W. D. Adams; 1 crate doves, W. F. X. Co.; 30 crates poultry.

S. S. Makura, Sydney—1 dog, K. Courtney.

S. S. Sierra, San Francisco—36 crates poultry, W. E. Bellina.

S. S. Lurline, San Francisco: 6 crates poultry.

*July.**Tuberculosis Control.*

The following dairies received the tuberculin test:

	T.	P.	C.
M. Nishimoto	22	22	0
M. Pacheco	10	9	1
A. Shimada	15	15	0
T. Gouveira	56	55	1
J. Gomes	59	59	0
M. T. Brazon	27	27	0
J. Alias	8	8	0
R. A. Franco	18	18	0
Chas. Bellina	209	181	28
Frank Andrade	127	109	18

From the above list it will be seen that a total of 551 head of cattle have been tested, out of which number 503 have been passed and tagged, and 48 condemned and branded. Of the condemned animals 46 have been purchased by the Wahiawa slaughter-house and are being killed at the rate of three or four a day; one has been slaughtered by a Chinese butcher on the owner's premises, and one is segregated awaiting disposition.

The cow which is now segregated and condemned here on July 29 was purchased by the present owner in Hilo, Hawaii, about six months ago and originally came from the Lyman estate, where it had been condemned by Dr. H. B. Elliot but remained unbranded. It was purchased as a sound animal for \$85 from a party in Hilo who had previously purchased it from the Lyman estate for \$30, knowing it to be a condemned animal but saying nothing about that to the present owner.

Importations of Live Stock.

S. S. Wilhelmina, San Francisco: 29 crates poultry.
 S. S. Manoa, San Francisco: 17 crates poultry.
 S. S. Siberia, San Francisco: 1 dog, Mrs. Jack Spreckels.
 S. S. Arizonan, Seattle: 200 hogs (slaughter), 500 hogs (P. M. Pond), 10 cows (Walter Love), A. L. Macpherson; 9 cows, 1 bull, Waialeale Ind. School; 10 horses.

S. S. Matsonia, San Francisco: 1 dog, Anita Gellenbeck; 33 crates poultry.

U. S. T. Dix, Seattle: 19 horses, officers' mounts; 1 burro; 1 dog, Lt. Col. Keefer.

S. S. Lurline, San Francisco: 24 mules, Schuman Carriage

Co. (9 landed here, 15 quarantined on Maui) ; 10 Berkshire hogs, W. E. Bellina; 1 crate live turtles, Yuen Chong Co.; 15 crates poultry.

Respectfully submitted,

L. N. CASE,
Assistant Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

Honolulu, August 25, 1915.

Board of Commissioners of Agriculture and Forestry.

GENTLEMEN:—I respectfully submit my report of the work performed by the Division of Entomology for the month of July, 1915, as follows:

During the month 58 vessels arrived at the port of Honolulu, of which 20 carried vegetable matter. Of these vessels 12 passed through the Panama Canal.

Disposition.	Lot.	Parcels.
Passed as free from pests.....	1007	19,117
Fumigated	3	861
Burned	24	24
Total inspected	1034	20,002

Of these shipments 19,868 packages arrived as freight, 47 packages as mail matter, and 87 packages as baggage of passengers and immigrants.

Rice and Bean Shipments.

During the month 38,708 bags of Japanese rice, 400 bags of Chinese rice and 2494 bags of beans arrived from the Orient. After thoroughly inspecting these shipments they were found free from rice, bean and grain pests and were allowed entry.

Pests Intercepted.

Twenty-one packages of fruit and one package of vegetables were taken from the baggage of passengers and immigrants from foreign countries and destroyed by burning. One lot of coconuts from Manila was treated with fumigation on account of being infested with scale insects (*Aspidiotus destructor*). Also 36 bags of coconuts arriving from Central America were fumigated as a precautionary measure. The soil was removed from a pot plant from Japan in which we found an ants' nest. A package of gladiolus bulbs had to be fumigated before delivery on account of aphid infestation.

Beneficial Insects.

On July 1 Mr. D. T. Fullaway again took charge of the Insectary and the following parasites were reared and distributed during the month:

Bred—

Tetrastichus	30,300
Diachasma fullawayi	913
Diachasma tryoni	554

Total bred31,767

Liberated—

Tetrastichus	28,100
Diachasma fullawayi	957
Diachasma tryoni	566

Total liberated29,623

Besides the above parasites of the Mediterranean fruit fly, we have also been able to liberate the following parasites for horn, house and stablefly:

African spalangia	900
Philippine spalangia	900
African hornfly parasite	500
Philippine pteromalid	500

Total liberated2800

For breeding purposes a total of 31,800 pupae were used and the grand total of liberations of all parasites, including *Opius humilis*, exceeded 32,423.

Hilo Inspection.

Brother M. Newell reports the arrival of eight steamers and three sailing vessels at Hilo, of which five steamers brought vegetable matter consisting of 228 lots and 3678 parcels. One crate of wormy turnips was destroyed and all other shipments were found free from pests.

Inter-Island Inspection.

During the month of July 63 steamers plying between Honolulu and the ports of the other islands were attended to. The following shipments were passed:

Plants	80 packages
Taro	403 bags
Fruit	39 packages
Vegetables	35 packages

Total inspected557

The following packages were refused shipment on account of infestation or of having soil attached to the plant :

Plants	17 packages
Fruit	20 packages

Total refused 37 packages

Respectfully submitted,

E. M. EHRHORN,
Superintendent of Entomology.

DIVISION OF FORESTRY.

Honolulu, August 12, 1915.

Board of Commissioners of Agriculture and Forestry.

GENTLEMEN:—I respectfully submit the following routine report for the Division of Forestry for the month of July, 1915:

ANNUAL FISCAL REPORT.

The first two days after my return to the office early in July were spent in writing a report on the work of this division for the fiscal year ended June 30, 1915. This with similar reports from the other divisions has been forwarded to the Governor for use in his annual report to the Secretary of the Interior.

APPLICATION FOR DEAD TIMBER.

An application was received from Mr. Edwin C. Moore in behalf of homesteaders in Kula, Maui, to remove and use for fence posts dead mamane trees from the Kula forest reserve. Reference of the application to the local district forester brought back the recommendation that the application be not granted. He informed me that, so far as he knew, similar permission had never been granted in the past, and he believes that to grant it now would lead to complications. Pending the time when I can become personally familiar with the situation, the permission has not been granted.

FENCING.

During the month it was possible to arrange for the survey of government boundary lines at Aliomanu, on the Moloaa forest reserve, Kauai. This was completed and I am now arranging with Forest Ranger Lovell to go ahead with the construction of the forest fence, which will be approximately three miles long.

ALGAROA INFESTATION.

The attention of this division was called to an infestation of the blossoms of algaroba trees by the receipt from Mr. Chas. H. Merriam of specimens of the infestation which came from near Kamalo, Molokai. This infestation is said to have caused a serious reduction in the volume of the algaroba bean crop in this region in the past and in the size of the beans. The Superintendent of Entomology reports that the damage is done by a small moth, the larva of which is responsible for attacking the blossoms; that it has been known to exist in the islands for some time and is found also on immature grapes on Maui; that it usually appears in dry seasons, and that some natural parasites keep it in check. While there is nothing specific that can be done at present to prevent this pest, it is believed that it will not grow any worse.

HONOLULU WATERSHED FOREST RESERVE.

The custom of requiring permits to burn brush and other similar material on Tantalus within the Honolulu Watershed forest reserve was continued by the publication during the month of a By Authority notice which extends this requirement through the period ending June 30, 1916. The object of this is to supervise such burning and reduce the fire danger in the planted and natural forest.

One day was spent with the forest nurseryman and two seed boys in thinning out the brush and branches along the road to the Pali so as to open up a view around a dangerous curve to make auto travel safer and in other places to afford a better view of the scenery in Nuuanu Valley. The eucalyptus plantation in this valley, started with federal funds, was also inspected and most of the trees found to be growing well.

HAWAII TRIP.

On July 28 I left for the Island of Hawaii to investigate several forest matters. The last two days of the month were spent on a trip in the mauka land of Humuula, where a small part of the Hilo forest reserve has been applied for as a homestead, and in the mauka sections of Piha and Laupahoehoe, where cattle

depredations have occurred on government land in the forest reserve. The results of my investigations will be made the subjects of special reports.

Respectfully submitted,

C. S. JUDD,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, August 13, 1915.

C. S. Judd, Esq., Superintendent of Forestry.

DEAR SIR:—I herewith submit a report of the principal work done during the month of July.

Nursery.

Distribution of Plants.

	In Seed Boxes.	In Boxes Transplanted.	Pot Grown.	Total.
Sold .....	....	...	694	694
Gratis	1000	941	513	2454
	<hr/> 1000	<hr/> 941	<hr/> 1207	<hr/> 3148

Collections.

Collections on account of plants sold amounted to.....	\$12.70
Rent of building, Nursery grounds, for June.....	35.00
Total	<hr/> \$47.70

Plantation Companies and Other Corporations.

The trees distributed under this heading amounted to 10,000 in seed boxes and 150 pot grown.

Seed Collecting.

The collecting of *Crevillea robusta* seed has kept the boys busy for the past three weeks. We have now got over 12 pounds of clean seed of this species. We have searched all the koa groves around Tantalus and Nuuanu Valley for seed, but have succeeded in procuring only a few ounces of good seed.

Makiki Station.

The work at this station has been principally routine. We are now getting together a large stock of plants and there will be plenty on hand for everybody when the planting season begins.

Honolulu Watershed Planting.

During the month 478 kukui trees were planted out along the ewa side of Herring Valley. Other work done consisted of hoeing and cleaning away grass and weeds from the trees recently planted. The first koa and kukui trees planted on the face of Sugar Loaf hill are making a remarkably fast growth, and it will not be long before they cover the ground completely.

Advice and Assistance.

The writer has been called upon to make visits and give advice as follows:

Calls to places in and around the city, 10; advice by telephone, 13; advice by letter, 7; advice given at Nursery, 9. Total, 39.

Respectfully submitted,

DAVID HAUGHS,
Forest Nurseryman.

EUCALYPTUS RECORD ON MAUI.

Makawao, Maui, August 18, 1915.

Editor The Forester.

Dear Sir:—In regard to a statement by Mr. C. S. Judd in The Forester concerning the yield of ironwood on Kauai, I beg to state that we have a better record in blue gum here at Kailili—one cord of wood to $3\frac{1}{2}$ trees at an average, eighteen years old grove. Some trees give more than two cords.

In these ten years there have been set out about two and a quarter million (2,250,000) trees in the forests of the Maui Agricultural Company at Kailili and Opana; but, as the first two years were spent mostly in experimenting, only a few trees being set out, most of the actual planting was done in eight years.

It is a pleasure now to see how fine the native undergrowth is springing up under the close-planted eucalyptus trees, so that the groves already make good water conservers, as well as they will make lumber and fuel in time to come. Of course, where the land has been used a long time for pasture and the Hilo grass has well settled, it will take a good while for the undergrowth to make much headway, but I hope it will come along well eventually.

Next season we expect to have between three and four hundred thousand plants to set out. About 50,000 of these may be sold to the small farmers and homesteaders at \$1.50 a thousand, cost price at this nursery.

Truly yours,

U. HANNESTAD.

THE SOW'S EAR.

(By E. G. CHEYNEY in *North Woods* for July.)

As long ago as Shakespeare's time, it had already become proverbial that "you cannot make a purse out of a sow's ear." The world is supposed to have advanced immeasurably in knowledge and wisdom since then, and yet, in spite of all our study and all our boasted efficiency, there are thousands of people twisting away at the patient old porker's ear in the vain hope of making something beautiful. This is especially true in respect to land. There is a prevalent idea, fostered by some real estate men, demagogues and misguided agricultural enthusiasts, that a paying farm can be made out of any kind of land. But it requires very little imagination to liken a paying farm to a purse, and a glance at history will soon convince any open minded man of the similarity of a portion of this fair country to a sow's ear.

In the old country the largest crops in the world are raised. This is partly due to the intensive methods used, but more largely to the careful selection of the land. Each little patch of land has a reputation for its ability to raise some particular crop. Some of it is recognized as unprofitable or even totally unfit for any crop at all. Even in this country certain classes of land are recognized. We hear of corn land, wheat land, clover land, etc., thus admitting that there are different grades of soil. Why not have the nerve to carry this to its logical conclusion and admit that there is some land which is not fit for any crop? Admit that a certain portion of it is a sow's ear? Admit that it is fit only for a forest?

In the early days in this state it was the ambition of every farmer to raise wheat. Land not in wheat was waste land. Gradually they began to realize that there were crops which would pay better than wheat on some land. As a consequence, the crops became more diversified and the profits larger and more sure. This recognized the principle that land was not fit for the purpose of producing any particular crop, but rather to produce revenue from anything that can be grown. Why, then, not extend this principle a little further and grow trees where they will produce the large return; and they will produce the larger returns on certain lands and under certain conditions.

This is sufficient evidence to show that there is a choice of land and a choice of crops; but little use is ever made of the

knowledge. A man buys a piece of wild land and clears it for a farm without once considering the capital he is investing or the probable returns. He, after he has eked out a miserable existence for years, may begin to realize that the timber he cut away and burned would have made him more money than he will ever make out of his farm. In other words, the farmer is groping blindly in the fog, a fog cast about him by his own hopes and ignorance, by the real estate men handling poor lands, and by the demagogues who are feathering their own nests by promoting a false boom for the country.

The value of other kinds of property is based on the revenue that they will produce. Even the rent of a farm land is figured on a percentage of the value; but the value is a fictitious one selected at random. Land is the only kind of property which is valued independently of its productive capacity—the only true basis of valuation.

Some day this fog will rise. The people will rebel against the tyranny of the land speculators and demand that the land be valued at its true worth. When they do, crop production will take its proper place as a solid business transaction, farm land will produce farm crops, forest land forests, iron lands ore, and there will be no waste land. The economic condition of the country as a whole, and more especially that of the forested portion, will be tremendously improved. The sow's ear will be left where it will at least be of some value to the sow and the farmer will be infinitely better off and happier with the more edible portions of the hog.

MUSHROOM CULTURE.

A. J. PINN, *Inspector of Agriculture, N. S. W.*

For the successful culture of mushrooms it is essential that the crop be grown either in very rich "made" soil or in a prepared manure bed, and in a temperature that does not exceed 86 degrees Fahr. and does not fall below 50 degrees Fahr. The second condition is obtained by making use of cellars, disused tunnels, old houses, etc.

Having obtained a suitable place, the bed must be prepared, its chief constituent being good horse manure that is fairly free from long straw: Two mediums are employed—(a) a mixture of earth and manure, (b) horse manure with no earth.

Where earth and manure are used, it is quite usual to mix a fourth or fifth part of good soil with manure fresh from the stable. The process of fermentation is then slower, and the heat more constant.

When manure only is used, the bed must be properly prepared, as stable manure ferments quickly and produces a degree of

heat that is unsuitable for the purpose. The method usually employed is to mix the manure thoroughly, so as to make it of even character throughout, place it in square heaps about 3 feet high, and then beat or tread it down well. If it is a little dry it should be moistened somewhat, and then left to ferment until the heat has increased to such an extent that portions of the manure in the center begin to turn white, which usually occurs in about a week. It is then necessary to break the heaps up and remake them as before, care being taken to place the material that has been on the outside of the first heap in the center of the second one, and so on. Within a few days fermentation will again have increased so much that it will be necessary to remake the heaps a second time. In a few days the manure will have become a brown color, and somewhat greasy. It will be found that, in order to obtain the necessary consistency, the heaps must not be of less size than a cubic yard.

When in the required condition, the manure should be made into beds about 2 feet high and with a base of 2 feet, and should have a flat surface, or, if made against a wall, it may slope from the wall to the floor. Beds are sometimes made in old tubs or half-casks. The beds should be firmed, and allowed to remain a few days in that condition before spawning.

The correct time for spawning is when the temperature is about 78 degrees Fahr., and this must be determined by taking the temperature.

The spawn is sold in brick form by leading seedsmen. For some days before spawning, the brick should be kept in a moderately warm, moist place, so as to stimulate the mycelium of the fungus. The bricks are sometimes moistened on each side and spread out between a couple of beds. Before use, the spawn should be broken up into pieces about 6 or 7 inches long, 2 inches wide, and 1 inch thick. Each piece is then inserted lengthwise in the bed and flush with the surface, openings having been made with the hands at distances of about a foot apart each way. Usually in beds 20 to 24 inches there are two rows, the pieces in one row being opposite the spaces in the other. The manure must be carefully pressed round each piece, so that it is covered to a depth of about 1 inch.

If the conditions are satisfactory, the spawn should commence to grow in about seven or eight days. At the end of that time, any pieces that have not commenced to produce white threads connecting with the surrounding manure should be replaced by fresh ones. In a fortnight or three weeks after spawning, the spawn should have spread throughout the bed, and should begin to show itself at the surface. At this stage the pieces of spawn should be withdrawn, or they will become mouldy and soil the mushrooms in their immediate vicinity. The empty openings should be carefully closed by pressing down the surrounding soil

or manure. The top and sides of the bed should then be covered with a layer of about half an inch of light loamy soil, in a fairly moist condition and lightly pressed down. When the surface becomes dry, light waterings should be given.

Within a few weeks of the last operation, the mushrooms should appear, and should continue to yield for two or three months. The watering of the bed is usually done with liquid manure, or water containing some nitrogenous fertilizer, such as nitrate of soda. The temperature of the liquid should be between 70 and 86 degrees Fahr.

Beds made in open places that are exposed to changes of temperature need to be covered with straw.—*N. S. W. Agricultural Gazette*.

EXPERIENCES WITH POULTRY.

ARTHUR E. BEST, N. S. W.

I have come to the conclusion that poultry, run in connection with an orchard, is a very good side line, amply paying for itself and leaving a small margin to spare. Besides reaping an egg crop, you have, or should have, from every twenty-five head of fowls 2 cwt. of manure per month, which in twelve months is a considerable help with young trees, seeing that with two-year-old trees about four shovelfuls of manure is a good supply.

In feeding the breeding pen I use half-pint bran, one pint pollard, quarter-pint dried blood and bone, and a little salt for the morning mash. This is mixed neither too dry nor too wet. At midday a liberal supply of green feed is put in, a small patch of kale being grown for the purpose in case the summer should be dry, and there should be no green stuff in the orchard. The evening meal consists of half-pint corn and one pint wheat. Plenty of clean cool water should always be before the fowls. For this I use a kerosene tin cut in halves, placing one half in a case set on its end, with the lid removed and the opening facing south. This keeps the water nice and cool, and prevents dirt and rubbish getting into the water. The hens should have a fair-sized pen so that they will have plenty of exercise, but they must not be overfed or else they will become too fat and the chickens will be weak. Oyster shell and broken crockery or shell grit should always be in the pen. For this I place in the pen a flat box—6 inches x 12 inches—with a piece of 4-inch wire netting over the top. This prevents the hens from scratching it out and wasting it.

When the eggs are collected for hatching they should be placed in a flat box with the small end up, and if you wish to keep them over a week, turn the box over once a day, and keep them in a moderately cool place. I do not think it is advisable

to wash the eggs intended for setting; the dirt should be rubbed off if there is any on them.

After many trials with the hen as a hatcher, and with sad disappointments, I have concluded that the artificial incubator is far the best; there is greater certainty about the chickens, and when they are hatched there is no trouble with vermin. For the room, 6 feet x 4 feet and 5 feet 6 inches high, with a solid ground floor, is the most economical; 22 feet of 3 x 2, 22 6-foot palings, and a roll of 15 feet of some roofing material, will make the required room. To ensure a steady temperature and prevent the walls from attracting the heat of the sun, the following solution is invaluable:—Six parts stone lime, two parts coarse salt, and one part alum. Slack the lime; dissolve the salt and alum in hot water, and add to the lime. When properly made this should have the consistency of paint. Put three coats of this on the walls, allowing a day between each coat of solution. It will last for years, and will not rub or wash off. On one occasion I turned the eggs on Saturday at midday, and did not return until Sunday at 9 p. m.; as I got 35 chicks out of 40 fertile eggs, I think this result speaks well for both machine and room. I may state that I only see my machine once a day, viz.: 8 p. m., when I turn the eggs.

During the first week the food I use consists wholly of rolled oats, but this should not be fed in a way that it will sour. I find that it should be crumbled a bit, and sprinkled over the run for the first two days. After that I place it in a trough specially made of galvanized iron, with bars of wire looped over the top, and soldered on each side. This is also a good idea for the water, as it prevents the chicks from getting into the water and keeps it clean.

My mixture for the chicks is one pint finely cracked maize, half-pint cracked wheat, half-pint linseed meal, half-pint coarse bran, half-pint rolled oats, half-pint sea shell grit, one pint lucerne dust, quarter-pint salt. This has proved very good with my little flock, and twice a week I give them one teaspoonful of Epsom salts to a pint of fresh cold water. A rough shed should be supplied for them also, so that as the chicks get older they can be put there to look a little after themselves. In this I place some stable manure, leaves, short grass, etc., and it is wonderful how the chicks thrive. Especially during the hot sultry weather should this be supplied; they have the shelter, also the ventilation, and room for exercise. I think this very essential for allowing the young chicks to run in.

As soon as I can discern which are cockerels I pen them off, and feed for the morning meal—three parts pollard and one part oilcake; maize at midday, or, if it is available, thick milk instead; then maize again at night. A little green stuff should be supplied for them to pick at during the day.—N. S. H. *Agricultural Gazette*.

SUNFLOWER-GROWING FOR SEED.

The sunflower will grow in almost any soil and in any climate. It will bear cold or heat, drought or rain. It is subject to no disease, and to no climatic disqualification. The cultivation is very simple. As stated, the plant is not at all particular, but prefers light, rich, well-drained soil. It is advisable to sow early say, the beginning of September—to secure perfect maturity. The quantity of seed required per acre will vary from 4 to 6 lb. It should be sown in drills, 5 feet between the rows, and the seed drilled or dibbled in at intervals of 3 feet. The plants may afterwards be thinned out, if found necessary owing to exuberant growth, to ensure exposure to the sun—a very necessary condition. As the plants have a habit of spreading their branches and heads in successive layers over each other, thinning is generally necessary. When 12 inches high, a slight earthing up benefits the plants. Sunflowers with many heads do not ripen the seed evenly, therefore it is better to cultivate a species producing only one large head to each plant.

The tall Mammoth Russian is such a variety, and may be planted closer. It produces more seed than any other sort, and can be obtained from most seedsmen in Brisbane, and probably elsewhere.

A yield of 50 bushels per acre is not uncommon under favorable conditions. The Mammoth; or Giant Russian, has often produced flower heads 15 inches in diameter and bearing over 2000 seeds.

The leaves of the sunflower, when sun-dried and pounded, and mixed with meal or bran, make good fodder for milch cows. The oil expressed is almost equal to olive oil.

We are not sure of the wholesale price now ruling for the seed; before the war it was quoted at £12 per ton.—*Queensland Agricultural Journal*.

WEEDS AND THE FARMER.

"It is said that man can get used to anything. He certainly has become used to acknowledge weeds as his master. They are sprawling like a great evil thing over the country, starving and choking to death millions of plants which are useful to us.

The tribute they take is enormous—incalculable. If we said that but for the weeds our crops would be as much again, we should not be guilty of exaggeration. And at a time when every meal produced at home is of special value, we let millions of them be destroyed by our enemy, The Weeds, because of quite a number of reasons.

Not because we do not know what to do—for we do. We

know every detail concerning weeds, their habits of life, their modes of attack, and the best way of attacking and killing them.

But we do not use our knowledge, because it is no one's business in the State to see what we do."—*The Smallholder*.

BY AUTHORITY.

TERRITORY OF HAWAII.

BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY.

RULE VIII—DIVISION OF ANIMAL INDUSTRY.

Rule and Regulation of the Board of Commissioners of Agriculture and Forestry concerning the Introduction of Hog Cholera Virus into the Territory of Hawaii.

The Board of Commissioners of Agriculture and Forestry of the Territory of Hawaii hereby makes the following rule and regulation for the purpose of preventing the further spread of hog cholera within the Territory:

Section I. Until further notice, the introduction of hog cholera virus into the Territory of Hawaii, by any means whatsoever and in whatever form or mixture and under whatever name or designation such virus may appear, is hereby prohibited, unless written permission is first obtained from this Board.

Section II. This regulation shall take effect upon its approval by the Governor.

Honolulu, Hawaii, July 15, 1915:

(Sgd.) LUCIUS E. PINKHAM,
Governor of Hawaii.

Approved: July 27, 1915.

BRUSH FIRES ON THE TANTALUS RIDGE, HONOLULU WATERSHED FOREST RESERVE.

Notice is hereby given that in accordance with Section 497 of the Revised Laws of Hawaii of 1915, fires to clear land, including the burning of fallows, stumps, logs, brush, dry grass or fallen timber, shall not be started for the period from the date hereof until June 30, 1916, on any land within the boundaries of that portion of the Honolulu Watershed Forest Reserve lying between Pauoa and Manoa Valleys; on that portion of the government land of Kalawahine lying outside the forest reserve; and on that tract known as the "Makiki Lots," unless written permission has first been obtained from the office of the Chief Fire Warden at the Government Nursery, King Street, Honolulu.

(Sgd.) C. S. JUDD,

Superintendent of Forestry and Chief Fire Warden.
Honolulu, July 17, 1915.

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A complete list of the publications of the Board available for distribution (together with the titles of certain issues now out of print) is to be found on the cover of the last biennial report.

Applications for publications should be addressed to the Mailing Clerk, P. O. Box 207, Honolulu, Hawaii.

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The records and maps of this division are available for inspection by any one who desires information relative to water resources, topography, etc. Blue print copies of hydrographic data relative to any stream, ditch, spring, etc., which may be under observation by this division will be mailed free of charge on request.

G. K. LARRISON,
Superintendent of Hydrography.

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DIVISION OF FORESTRY.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Alizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haugh, Forest Nurseryman, Box 207, Honolulu, Hawaii.

C. S. JUDD,
Superintendent of Forestry.

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To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications **SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.**

EDW. M. EHRHORN,
Superintendent of Entomology.

THE HAWAIIAN FORESTER AGRICULTURIST

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TWO RECENT BOOKS.

In reviewing two new works the Philippine Journal of Science offers the following introductory remarks, the author of the article being Prof. C. F. Baker, A.M., an associate editor of the Journal:

"The literature of tropical agriculture has been notably enriched by the appearance of these two new works. The development of tropical agriculture during the past twenty-five years has presented many interesting and noteworthy features. It has differed markedly from the development of temperate-region agriculture, and it has been able to borrow comparatively little from the latter. Many of its crops are entirely peculiar to the tropics, and tropical conditions furnish a series of wholly unique problems. Tropical planters have had to feel their way by painful steps, gradually gaining the local experience necessary for successful, practical operations. Even this kind of development has been far more rapid than in the case of temperate-region agriculture, largely due to the fact that tropical agriculture has been characterized by the investment of large capital. The capital invested gradually drew to its service well-trained technical men from the temperate countries. In late years the establishment in colonial possessions of active agricultural experimental stations has given a great impetus to the development of the technical side of tropical agriculture. Much of the early literature of tropical agriculture consisted of accounts of the personal experiences in tropical planting of untrained men, some of whom, however, in the school of hard experience finally became very successful planters. Until within the last decade really high-grade technical works on tropical agriculture were very few, and even yet works like Semler's *Tropische Agrikultur* and Warburg's *Die Muskatnuss* remain very rare."

More than thirty years ago the late Albert Jaeger, the commissioner of agriculture who started Tantalus forest, remarked to the present editor of the Forester that there was at that time practically no literature of tropical agriculture. According to the Philippine reviewer the lack has been only recently supplied, and that with much yet to be accomplished. Readers of the Forester will recall some contributions from Hawaii to the literature in question which have had wide publicity in official prints and

magazines of tropical agriculture in countries far apart as the poles. The works now noticed by the Philippine magazine quoted are one on "Cocoa" by Dr. C. J. J. van Hall, director of the Institute for Plant Diseases and Cultures, Java, and the other on "The Coconut," by Edwin Bingham Copeland, professor of plant physiology and dean of the College of Agriculture, University of the Philippines. Both are published by Macmillan & Co., Ltd., St. Martin's street, London. "The two books under consideration," the reviewer says, "well represent the college grade of tropical agricultural science. They are exceedingly rich in the application of modern science to the growing of two very important tropical crops. They probably represent the highest development yet attained in the agronomy of any tropical crop." As the coconut appears to be the livelier subject of the two products treated in the books mentioned, so far as Hawaiian industries are concerned, the following excerpt from the review of Dr. Copeland's work is selected for reproduction here:

"Doctor Copeland's book is a splendid example of scholarly and scientific treatment. It is, perhaps, the best case extant in a work on any single major tropical crop of the application of modern biological methods to all the details of the agronomical side of the subject. An innovation in this work, of the highest possible importance, consists of a thorough consideration of the physiology of the coconut tree. There is no doubt that this will prove an epoch-marking event for the agronomy of all crops and of all countries. We would have little respect for a system of medicine, or confidence in its methods, in which there was no provision for thorough technical study of the physiology of the human body, yet the agronomy of most tropical and many temperate crops is exactly in this condition—the details of the life operations of the plants in question, as to their foraging ability, food elaboration, water requirements, transpiration habits, organic reaction to surrounding conditions, and specific reaction to disease, being unknown. The experience of the practical planter is one continuous struggle with serious problems, many of which might easily be solved through fuller knowledge of the detailed physiological operations and needs of the plant he is attempting to grow. It seems that if anything is to be expected from real colleges of agriculture as distinguished from farm schools, and more particularly expected from colleges of agriculture in universities, it is a thorough grounding in these basic lines of work that shall enable students to approach the practical problems of agronomy with broad intelligence and really adequate equipment.

"In this connection Doctor Copeland's book furnishes the best example of what a textbook for a college of tropical agriculture should be. His work is, of course, not final in any respect, and he clearly recognizes, as does Doctor van Hall, that the science of tropical agronomy is an extremely undeveloped one. In the

face of this fact some temperate-region agronomists do not seem to be able to understand why things should not be done thus and so in the tropics—along lines well established in temperate regions. The light will not dawn upon such, or rather the knowledge of the lack of light, until they join the ranks of pioneers in a new tropical country and undertake the practical establishment of well-ordered cacao or coconut plantations. It is evident, for instance, in Doctor Copeland's discussion of fertilizers, that the subject is still an open one, no comprehensive experiments having yet been carried through a sufficiently long term of years. The subject of the seed selection of the coconut still requires thorough investigation and experimentation.

"Doctor Copeland does not mention the interesting case of the small island of Rotumah in the South Seas, which is said to produce coconuts of unusual size and value. These coconuts, in years past, are said to have been used extensively for the establishment of plantations in other islands, some being reputed to have brought as much as a shilling apiece as seed. It would be a matter of the highest interest and importance to trace the results obtained from these seeds in other islands and under other conditions."

An article in this number from the *Tropical Agriculturist* (Ceylon) on new types of tobacco should be interesting to the pioneers of Hawaii's revived tobacco industry.

Both interest and value are added to the article from the *Maui News*, replying to the *Garden Island*, on the homestead question, which is reprinted elsewhere, from the fact that the *Maui* writer (Mr. W. J. Cooper) is himself one of the *Kuiaha* homesteaders.

W. T. Cox, in the *North Woods*, organ of the Minnesota Forestry Association, advocates the use of aeroplanes in patrolling forests for the prevention of fires. This is not so wild as it might otherwise appear, because there is a possibility of securing coöperation with a naval aero station in Minnesota. Mr. Cox points out that the lake-dotted area of the northeastern part of the State is peculiarly adapted to patrol by the use of hydro-aeroplanes or flying boats.

Messrs. Russell and Budden, in discussing the results of the application of various disinfectants to the soil, conclude that none of the well-known antiseptics is as good as steam either in increasing the amount of ammonia in the soil, killing insect and fungoid pests, or in inducing a good soil development.—*Tropical Agriculturist*.

DIVISION OF HYDROGRAPHY.

Honolulu, August 7, 1915.

Board of Commissioners of Agriculture and Forestry.

GENTLEMEN :—The following report of operations of the Division of Hydrography during the month of July, 1915, is submitted:

RAINFALL.

The rainfall for July was nearly normal. No heavy storms occurred, but all islands were fairly well supplied with rain in the nature of moderate showers. Streams show discharges above the average for this time of year, and the Nuuanu reservoirs are well filled.

LEGAL WORK.

A large part of July was spent in computing and furnishing to the Attorney General's office, estimates and data in relation to the Waiakoloa (Waimea, Hawaii) water case. These estimates and data will be used as testimony for the Territory at a later date.

HONOLULU WATER SUPPLY.

Several days were spent on the collection and preparation of data relative to the future water supply of Honolulu.

PREPARATION OF ANNUAL AND BIENNIAL REPORTS.

A report of operations covering the biennial period ending June 30, 1915, which will include all data collected during this period, is being prepared. This report will be published by the U. S. Geological Survey at Washington, D. C., and it is expected that about one year will elapse before the report is available. Blueprints of all data to be contained therein, for any especial location, may be received by applying for the same at this office.

REPORTS.

Kauai.

Mr. Hardy spent about half, and Mr. Horner about one-third, of the month collecting and preparing data for the 1915 biennial report. In the field, 34 streams and 17 rain-gaging stations were visited, and 14 stream measurements were made at regular stations.

Oahu.

Only routine operation and maintenance work was done. Thirty-six stream and three rain-gaging stations were visited.

Fifteen stream measurements at regular stations and two miscellaneous measurements were made. A large amount of private rainfall and ditch discharge measurements were collected for the 1915 biennial report.

AUGUST PLANS.

Kauai. In addition to regular routine work, new ditch measurement stations will be established on the Kekaha and Waimea ditches and materials will be hauled and preparations made for the construction of three new stream-gaging stations on the three main branches of the Waimea river above all intakes.

Oahu and Maui. Only necessary routine work will be attempted. All employees will be used as much as possible on the preparation of data for the biennial period ending June 30, 1915.

Hawaii. The Superintendent of Hydrography will spend the greater part of the month at Waimea, Hawaii, assisting the Attorney General's department in the Waiakoloa water case.

Very respectfully,

G. K. LARRISON,
Superintendent of Hydrography.

NEW LIGHT ON POTASH POSSIBILITIES.

The London Public Ledger, quoting the New York Oil, Paint and Drug Reporter, gives us, under the above heading, the following interesting information concerning America's efforts to make herself independent of Germany's potash supplies, or to need them as little as possible.

The stirring course of muriate of potash, we are told, sales of round quantities having lately been made at \$200, with prospects of further sharp advances, centers unusually keen interest in the latest official report of developing a commercial production of potash in California. Dr. Norton, who is conducting investigations into our potash possibilities for the Government, treats the subject with a thoroughness of detail both from the technical and practical viewpoints. His technical qualifications have been fortified by a valuable practical training acquired during his consular service in Germany.

Dr. Norton speaks most hopefully of the saline deposits at Searles Lake, in San Bernardino County, California, as a potash source, and the company which has undertaken the most capable utilization of the vast visible supply of raw material has expressed its hope of marketing potash salts within a few months. The commercial possibilities of these saline deposits are strengthened by the fact that they contain borax, sodium sulphate and carbonate and common salt, besides being rich in potash.

Much attention is given to the utilization of the enormous

masses of seaweed off the Pacific Coast as a solution of the potash problem, and while engineers who have studied the methods so far employed to develop the kelp industry have expressed doubt as to the possibility of its becoming a serious factor in the production of potash salts, the leading company engaged in the extraction of kelp is credited with confidence in its ability to build up the industry on a substantial commercial basis. Dr. Norton reports assuringly on the factors of cost of production, cost of handling and physical properties as contributing to make dried powdered kelp seemingly the form in which a substantial commercial demand can be most quickly secured and a form which would appeal rapidly to the manufacturers of mixed fertilizers.

The contamination of soda has been the greatest problem in the extraction of potash from kelp, both the dissolution and ordinary crystallization processes being inadequate to overcome on a practical scale the closeness of solubility between potash and soda. Dr. Norton regards the employment of a new method of fractional crystallization as an important step toward the solution of this difficulty and the operation of this process opens a hopeful field for our potash independence. Government experts have estimated that two annual cuttings of the kelp beds off the coast of southwestern California would yield 59,000,000 tons, or the equivalent of 2,300,000 tons of potassium chloride, which, if marketed at current rates, would yield about \$90,000,000, but if the kelp crop were dried and marketed at prevailing prices for both the potash and nitrogen content its value would exceed \$150,000,000.

Dr. Norton's report offers little encouragement for the commercial extraction of potash from the mineral deposits of California, for, while they contain frequently relatively high percentages of potash, they are not sufficiently high to overcome the serious difficulty of remoteness from existing conveniences for transportation, the chief demand for potash as a fertilizer coming from the eastern half of the country and very largely from the Gulf States.—*Tropical Life*.

SIR HORACE PLUNKETT ON COÖPERATION.

[Address at the Congress of Tropical Agriculture.]

We are to deal today with a subject to which perhaps I may attach undue importance, but as we have to deal with it in an hour, that renders it impossible for me to do justice to the subject without doing grievous injustice to those who have prepared papers, and to those who wish to hear them. I recognize that there is one limitation upon our discussions. We are not here to treat of general principles, but rather of their particular application to certain countries, so that I shall devote the very few

remarks I shall make to what you may possibly find of suggestive value in the coöperative movement generally in these islands.

As we all know, the coöperative movement began in England in the "hungry forties," and has extended since all over the world in its various forms. The first thing that I have to say about the coöperative movement in England is that it hardly touched agriculture at all until the beginning of the present century. In Ireland, on the other hand, just a quarter of a century ago, the agricultural coöperative movement was founded to deal with the special circumstances of that country, and there are, I think, a few points in that movement which are worthy of consideration from those who come from tropical countries. Ireland, of course, is a country where, meteorologically speaking, the temperature is low, and I realize that I must remember the warning given to us by the President of the Congress in his opening address that no knowledge of general principles will avail without a knowledge of the conditions of tropical countries. But in Ireland we had to supplement an agrarian revolution, which was about to transfer, and has now about half transferred, the agricultural land of the country from a small class of landlords, largely regarded as aliens, to a numerous class of cultivators, mostly peasant proprietors. The State, by the advance of some £200,000,000 sterling, and large sums given as a free grant, are carrying out this huge transaction, but they are doing nothing, and could do nothing, or could not do much, to make the necessary changes in the social economy of the agricultural classes which would be required in order to enable the new owners of land to prosper, and to fulfil their huge obligation to the State. We laid down, after years of thought and experiment upon the question of a satisfactory rural economy, two main propositions. The first is that if you want to solve the modern problem of rural life—that is, the problem of inducing and enabling people to maintain a decent standard of comfort in a rural existence in these days of world-wide competition—you have to approach the problem from three points of view. You have to look upon agriculture as an industry, as a business, and, what is perhaps more important than all, as a life. You have to bring into industry the teachings of modern science, into business the methods of our modern business, and into life a scheme of social attraction and amenities; certain intellectual advantages which will enable rural life to resist the lure of the city. The first proposition is, then, that you have to deal with the problem on its three sides; and the second, that you must deal with the business of farming, and the chief reform you have to make there is to introduce methods of combination. We live in days when everything has to be done in a large way—to be done to pay—and when the small producer is at the mercy of powerful middle interests, trusts, combines, and so forth; so that the first thing is to get a sound economic basis by teaching the farmers to combine, and the only method of com-

bination which is suitable to farmers, as we all know, is not the joint stock method, but the coöperative movement. I have always felt that the reason that agricultural coöperation lags so far behind—the reason why even in this congress it is not thought necessary to give more than an hour or so out of a week to the discussion of agricultural coöperation—is that in the urbanization of all thought people in these days think the town method is suitable to the country conditions. They are still hankering after the joint stock method, and have not yet learnt that coöperation is the only method suitable to agricultural conditions. Therefore, we say you have to start by teaching coöperation, and that until you have done that you cannot successfully introduce scientific methods into the practice of agriculture, nor until you have got people to come together in the business of their lives, can you get them to come together for higher intellectual and social purposes.

Our formula in Ireland for solving the rural problem has some notoriety now. It is better farming, better business, better living, and we say that you must begin with better business, and that better business is coöperation. Now I say nothing about the Eastern origin of the most typical of the Irish people. I think myself that their addiction to coöperation has a great deal to do with that. But, broadly speaking, the Irish people belong to the associative races rather than to the individualistic, and that is a tremendous advantage, and it is in that respect that I think many of the tropical countries, especially India, might learn a great deal from our work in Ireland, not so perhaps from the successes as from the failures. I myself have had five-and-twenty years of work in that country, and I have learnt far more from my failures than I have from my successes; and I am in a position now, in dealing with people who have the same kind of outlook towards this problem, to suggest to them how to avoid many of the mistakes we have made.

The most important respect of all, I should say, in which coöperation in dealing with the tropics has to be studied is in the precise relations which ought to exist between State assistance and organized voluntary effort. As you go down in the economic and social scale, it becomes more and more necessary to develop self-reliance, but at the same time it is more and more necessary to begin with State assistance without weakening the patient's resistance to the many diseases which attack the principle of self-help.

I have one practical suggestion to offer, and that is that this Congress should recognize that agricultural organization is not an amateur business but a very highly technical business, and that men must be trained for it if they are going to have any success in it. That we have learnt in Ireland; they have learnt it in England; and they have learnt it in Scotland. We have had in these countries, where the whole trend of thought had

gone against coöperative action, to found agricultural organization societies simply and solely for the purpose of teaching people who do not understand coöperation how to organize coöperative associations for every agricultural purpose; and I happen to know that they are coming to this view in the United States and in Canada, and that schemes are on foot for training organizers to start coöperative movements in these countries. I believe that at the Tropical Agricultural College which is about to be founded somewhere in the Empire, in order that teachers qualified to teach scientific principles of agriculture should be able to learn how to apply those principles to tropical conditions, it is highly important that agricultural coöperation should be taught in this college, and that the agricultural organizer, even if he has learnt his business, as he can learn it in these islands, should go there and learn how to organize in the wholly different conditions of the tropical countries.

ECONOMIC VALUE OF BIRDS.

By F. L. WASHBURN, *Minnesota State Entomologist.*

With a total production of approximately \$9,000,000,000 worth of agricultural and forestry products in the United States, which products suffer a loss of about \$800,000,000 every year through the voraciousness of insect pests, it is not to be wondered at that anything which tends to decrease that loss by which our nation is robbed each year, is of special interest. It is the work of the economic entomologists to restore to the agricultural classes as much as possible of this loss, and, by their researches, to place citizens on their guard against insect enemies. They have been reasonably successful in their efforts, as shown by the large appropriations for this work made by federal and state governments. Massachusetts, for example, has used, in the past, \$150,000 annually to combat the gypsy moth, to which must be added approximately \$100,000 spent by private citizens in that State, and \$10,000 contributed by the United States government. New Jersey is on record as spending \$350,000 a year in fighting mosquitoes alone. Losses from the San Jose scale, codling moth, Hessian fly, chinch bugs, and grasshoppers have been materially reduced through the work of our entomologists, who have also lessened by nearly or quite half, the \$100,000,000 loss on stored products, such as mill stuffs, fruit, cotton, woollens, etc., suffered each year in the United States.

In considering the work of entomologists, however, we must not overlook the value of our birds—many of them wrongly suspected of being without any redeeming quality—in keeping in check the hordes of insects and four-footed vermin that prey upon the crops of farmers, gardeners, and orchardists. The amount of insects eaten by birds and brought to their young by parent birds is almost incredible. For example, 76 per cent of

the food of the bluebird is composed of insects and insect-like animals. The house wren has about the same record. Meadow larks consume cutworms, wire worms, crickets, and grasshoppers, as well as other injurious forms of insect life. The chickadee, from its being an all-the-year-round resident, is particularly useful in eating eggs of plant lice, or canker worms, and of tent caterpillars. Four stomachs or crops of chickadees examined, showed, as a result of a single day's feed, 1028 eggs of canker worms, while in one of the stomachs there were 150 eggs of plant lice. With the chickadees in winter, one frequently sees the downy woodpecker, another useful resident, as is also the brown creeper and the nut hatch. Almost all of our woodpeckers are devourers of grubs working on shade trees.

Most of our hawks and owls prey upon rabbits, gophers, and squirrels, field mice, etc. Some of our smaller hawks, notably the sparrow hawk, eat insects. Wrong impressions prevail regarding this group of birds and the farmer's boy has felt justified in shooting every hawk and owl met with, under the impression that he was doing agriculture a good turn thereby. As intimated above, many of our hawks and owls are decidedly useful. Crows also frequently pick up white grubs turned up by the plow, and we have seen both blackbirds and crows in large numbers eating grasshoppers in stubble fields. Of course, there are times when a farmer or poultry raiser or berry raiser is justified in resorting to a gun, but such times should be rare.

The cuckoos, both yellow-billed and black-billed, are fond of hairy caterpillars—the tent caterpillars and fall web worms, for example. The rose-breasted grosbeak is not only a beautiful bird, and fine singer, but a good bug catcher as well. We have observed it eating grasshoppers and potato beetles, and it is known to consume canker worms, army worms, cutworms, and chinch bugs. The gulls flying on our prairies and their close allies, the small and graceful terns, do the farmers a good turn (no pun intended) by catching grasshoppers.

Amongst our game birds, the quail gets most of its grain after the crop is harvested. It pays for it by eating many injurious insects—potato worms, wire worms, cutworms, and others. Over 100 chinch bugs were found in the crop of a quail shot early in the morning. It is almost a pity that this bird is not constantly protected. The same might be said of the ground or mourning dove, which is included in our game birds, and which is a great devourer of weed seeds and takes but little grain.

There are, of course, some bad birds, such as the sharp-shinned hawk, Cooper's hawk, the goshawk, and the yellow-bellied woodpecker, which sucks the sap from our shade and fruit trees; and, let us add, the European or English sparrow. There are also some birds of doubtful utility, but take it all in all, the birds, as a class, deserve our protection and the evident growth of sentiment toward bird conservation as evidenced by the pas-

sage of federal and state laws, the formation of bird clubs, and the increase of literature upon this subject is an encouraging sign—all indicating a growing knowledge of the usefulness of our feathered vertebrates.

Referring once more to individual birds, in 1083 stomachs of the red-winged blackbird examined, weed seed comprised 54.6 per cent of the contents, grain 13.19 per cent, grasshoppers (in August) 17 per cent, caterpillars 20 per cent in March, and beetles 10 per cent. In 138 stomachs of the yellow-headed blackbird, insects comprised 33 per cent of the stomach contents, weed seed 28 per cent, grain 38 per cent. In the case of the crow blackbird, as a result of the examining of 2346 stomachs, it was found that insects comprise 27 per cent of the food. It is to be borne in mind that nestlings of all of these blackbirds are fed upon insects or insect-like animals. In the case of the cedar wax-wing or cherry bird, only nine out of 152 stomachs (40 of which were taken in the cherry season) contained cultivated cherries and their stomachs have been found filled with canker worms.

Inasmuch as birds collect most insects at the time they are feeding their young, and since they get them as near the nest as possible, making many trips each day, it behooves us to encourage the nesting of birds in every possible way upon our farms and near our gardens and orchards and shade trees.

Much remains to be done yet through our teachers to reach the hearts of our school boys, not naturally cruel (unless it be that they pass through that stage of life and outgrow it), but thoughtless, and interest them in the conservation of bird life in order that they may grow up into clean sportsmen, gentlemen in every sense of the word.—*Fins, Feathers and Fur.*

CHARCOAL AND SOILS.

GEO. A. RETAN, *Mount Alto Pennsylvania Nursery.*

Every farmer, gardener and nurseryman should be familiar with the results of experiments carried on for a period of three years, which have demonstrated that charcoal can be made of great use in improving the structure and properties of the soil.

It improves the water and air content of the soil, loosens and intensifies the sub-soil, apart from the chemical materials it may carry, and from its uses with manure. These are not theoretical, but practical conclusions drawn from the use of charcoal in one of the largest nurseries in the State of Pennsylvania, under the management of the writer.

Two general classes of material are available for purposes of fertilization. In the first class are commercial fertilizers. In the second class are those indirect fertilizers which do not furnish plant food directly, but by their action upon the soil may so affect it as to make plant food available by setting it free, through

the altering of the physical condition of the soil. The principal fertilizer in this class is lime. Lime is really a stimulant instead of a plant food, and its continued use may be harmful or exhausting to the soil. Air, water and heat are more necessary for plant growth than mineral food. Production depends upon the proper aeration of the soil, the maintenance of a proper water content and through these two, the raising of the temperature of the soil. These conditions add plant food in that they render available the material that is stored away in soil compounds. The control of moisture in the soil lies in the physical state of the soil. If it is loose, porous, small grained, it will raise moisture freely from the sub-soil and hold it where it will be available for the plants and retard evaporation. The soil may be kept in such condition by proper tillage and by the addition of such materials as will effect a loosening and breaking up of the soil particles.

Green manure is valuable and barnyard manure and charcoal, with constant tillage, are among the best known agents. In using barnyard manure the best part of the manure is often lost. A large part of the mineral content is washed out if the pile is exposed and the liquid portions leak out or escape in gases. Many different substances have been tried for the purpose of preventing this loss. One of the very best materials which can be used for this purpose is charcoal. This is true because of its exceptional power of absorption, it possessing the capacity of absorbing many times its own weight in moisture and also because its physical effect upon the soil and the sub-soil has been conclusively demonstrated. Charcoal is already extensively used as a deodorizer or disinfectant, and the fact should not be lost sight of that the ammonia gas, which is quite lost in the manure heap, would be absorbed by the charcoal and made available for plant use.

For many years the attempt to raise coniferous seedlings in this nursery was a comparative failure because of the hard clay soil, which greatly increased the loss from unfavorable moisture and surface conditions. Among the agents tried for the relief of this condition were green manures, fertilizers and charcoal, and of these only the last has proved successful, as may be observed by the size and weight of seedlings developed from clay beds, fertilizer beds or charcoal beds. The seedlings are much larger and heavier and of better color on the charcoal beds than on any other. Some fertilizer beds show good seedling development, but the beds were not as densely covered with little trees as on the charcoal beds, notwithstanding that the charcoal beds were in the worst section of the nursery, while the fertilizer beds which show the best weights were in sections cultivated for a longer period. The charcoal seedlings averaged a weight of 250 grams for a bundle of 100 trees, as against 127 grams for a check bed in the same grade of soil. These trees were two years old. At one year the differences are not so striking, but are strongly marked. One hundred seedlings from a clay bed weighed 22 grams, while

the same number from a charcoal bed weighed 40 grams. These beds contained a relatively large quantity of charcoal, such as could only be used in hotbeds, gardens, or other intensive work. But the same tendency is shown in the use of smaller quantities. Furthermore, the soil conditions are exceptionally bad in this nursery.

From constant observation and experiment, the action of charcoal that makes it so valuable in the nursery seems to be entirely in the improved conditions of moisture and warmth. It might be thought that charcoal would loosen the soil to the extent that it would dry easily if used in large quantities, but the opposite condition occurs. In dry periods the power of the soil to retain water is increased, and in wet seasons the soil drains quickly with a consequent prevention of fungus that always follows a wet season in a coniferous nursery. The clay beds, by reason of their caking habit in dry weather, and poor drainage in wet weather, exerted the opposite effects and the loss was much more marked. In some cases it was complete. Again, charcoal beds are much warmer, because of the darker color imparted to the soil. This is of the greatest importance in the spring, when the ground has a tendency to be cold. Germination is almost entirely dependent on the warmth present and is consequently greatly helped by the darker color of the soil. Since the darker colored soil does not radiate any more rapidly at night, this heating effect is carried forward into the night and lessens the liability of damage from frost. In gardens and hotbeds, this is of considerable importance. This increased heat is of value in another direction. The aeration of the soil depends upon the heating, and it will be greater in the soil which becomes warmer during the day.

Thus we find that the action of charcoal in the soil is exerted along the lines where the most can be accomplished. The physical conditions of the soil are so improved that the air, heat and moisture coming to the crop is regulated in the most advantageous manner, and mechanical analyses of the sub-soil have shown that the charcoal exerts a beneficial action at a considerable depth, twelve to eighteen inches below the surface. The sub-soil beneath charcoal beds is of a better color and better physical structure than soil from the surface of untreated beds. This means an increase in the water-holding power, and a breaking up of unavailable compounds into available plant food.

To the farmer especially, the use of charcoal extends a wide range of advantages. He can add to the value of his manure, can improve the sanitary condition of the barnyard, poultry house, hog pen, etc.; and at the same time improve the physical condition of his land. When used in larger quantities in gardens, nursery beds, and in intensive cultivation, it offers the best physical condition for the growing crop with a decrease of loss from fungal attacks. The action of charcoal is comparatively permanent as compared with the other agents, which are used

for the same purposes. Experiments carried on over three growing seasons have shown no lessening of the effects under the most unfavorable conditions. The agriculturists of the future must look forward to the conservation of the resources of the land. This is accomplished best by proper control of physical conditions with the subsequent fullest utilization of the natural forces of sunshine, air and moisture. Any man who will look forward to such a careful utilization of his land will surely increase his wealth materially.—*North Woods (Minnesota Forestry Association)*.

MANURING COFFEE.

The manure most commonly used for coffee at S. Paulo consists of stable dung, previously limed and mixed with coffee hulls. When these materials are scarce, poudrette and guano are used. It may be assumed that a three-year-old coffee plant requires 3-4 gms. of lime, 1.2 gms. of magnesia, 6.3 of potash, 0.7 of phosphoric acid. The stable manure used contains in 1000 parts by weight 3.3 of lime, 3 of magnesia, 0.2 of potash, 4 of phosphoric acid; the hulls contain per 1000: 3.9 of lime, 1.7 of magnesia, 20.7 of potash and 1.7 of phosphoric acid. The poudrette employed, in default of the preceding manures, contains 6 per cent of nitrogen, 2 per cent of phosphoric acid and 2 per cent of potash; the guano used in the best farms contains 4.5 per cent of nitrogen, 10.5 per cent of phosphoric acid, and 4.5 per cent of potash; their price delivered at Santos is respectively 7s. 6d. and 6s. 6d. per cwt. First of all 16 to 24 cwt. of lime per acre are spread between the rows, then half a shovelful of stable manure and 22 lbs. of macerated coffee hulls to every four plants; in the case of new plantations only the lime is given.

Opinions differ as to the advantage of using artificials for coffee. Nevertheless, the writer has conducted for the last eight years several experiments on chemical manuring in several plantations, in view of the fact that the question of manuring coffee is becoming more urgent on account of the insufficient quantities of stable manure produced, which allow of its being used only once in 10 to 20 years. The following results were obtained in a plantation 50 years old which was completely impoverished. The experiment was begun in 1910; in the manured plot each plant was given 1.2 lbs. of a mixed fertilizer containing 75 gms. of potash, 52 gms. of phosphoric acid and 28 gms. of nitrogen; the unmanured plot was given a single dressing in 1912 of stable manure with coffee hulls.

Yield of 960 coffee plants with and without artificials:

Manured—1912: 97.62 bushels, 10.37 cwt., 9.41 bushels per cwt. 1913: 90.06 bushels, 11.55 cwt., 7.80 bushels per cwt. Total and average, 187.68 bushels, 21.92 cwt., 8.56 bushels per cwt.

Unmanured—1912: 56.38 bushels, 4.72 cwt., 11.94 bushels per cwt. 1913: 59.81 bushels, 6.78 cwt., 8.81 bushels per cwt. Total and average, 116.19 bushels, 11.50 cwt., 10.10 bushels per cwt.

The difference in the bushel-weights of the manured and unmanured coffee should particularly be noticed.—*Monthly Bulletin*.

*AN INTERESTING LETTER CONCERNING OAHU'S
GEOLOGY.*

The College of Hawaii.
Honolulu, Hawaii, Sept. 29, 1915.

Editor Hawaiian Forester and Agriculturist.

Dear Sir:—I think that Forester readers will be interested in this hitherto unpublished letter by the late Doctor Sereno E. Bishop concerning geological formations on Oahu. The letter was made available to me through the courtesy of Mr. Merryman, at the U. S. Magnetic Observatory, Ewa.

Very truly yours,

VAUGHAN MACCAUGHEY.
Honolulu, January 18, 1915.

Mr. S. A. Deal, U. S. Magnetic Observatory, Ewa, Oahu.

Dear Sir:—Your letter is before me asking "for information concerning the coral plain forming the southwestern part of this island."

I cannot claim much knowledge of the science of geology, but many facts peculiar to the structure of the rocks, mountains and shores of these islands have engaged my attention.

I will try to state such information as I possess in respect to "the depth of the coral, its method of formation and elevation, probable age," etc. Also I will state the theory of the subject as it has taken shape in my own mind, very probably not materially differing from that of others.

The island of Oahu is composed of two separate masses of volcanic mountains, the eastern or Konahuanui, or Koolau mountain, slightly encroaching on its older sister, the Waianae mountain, at the southern extremity of which stands your observatory. Both mountains are of great antiquity, evidenced by the enormous erosion or weathering which they have undergone. This slow gnawing away by the rain storms has largely obliterated the original dome-form of these piles of lava-flows whose strata lie exposed in the numerous deep ravines. The only remaining traces of the original dome-surface are the short slopes of the foothills which survive on the west side of the Koolau range, and a very little on the SE. flank of the Waianae mountain. What remains of both mountains are the skeleton ridges and pinnacles.

Waianae, being much the older, has suffered much the greatest change.

Besides that form of change, the whole island, probably from a very early period, has experienced great subsidence of level beneath the ocean. This subsidence has been doubtless more than 1500 feet. The evidence of this is the depth at which coral has been found in artesian borings, coral not being possible of growth at more than perhaps 20 fathoms of depth. Also the vesicular structure of the lava found at all depths reached by the borings proves the original position of those lavas to have been above sea level, since the pressure below that level would have prevented the occluded gases of the magma from expanding.

At an extremely recent period the whole island of Oahu underwent an apparently simultaneous elevation of level, amounting to from 30 to 50 feet, those being the altitudes at which formerly submarine formations are now found in position above sea-level. Among such elevated calcareous formations of greatest altitude are: coral reef on bank of Pauoa stream, a little below School Street bridge in the city; reefs in Waianae near the railway, adjacent to high lava promontories, and at the north end of the island, a number of masses of ancient *sand dunes* which had been submerged and cemented into hard sandstone by marine action, but were later elevated, and now indicate that marine action to a present height of 50 feet.

As to the depth of the coral in your locality, I would suggest an approximate estimate as follows: I find by the latest map of Oahu that Barber's Point lighthouse, near which I believe is the observatory, is about three and a half miles from the nearest point of the base of the mountain where it meets the plain. Also from that base to the nearest peak is but a slightly greater distance. I think it safe to assume that the grade of descent was the same from the same present base of the mountain to the bottom of the coral reef at the Point. The present altitude of that peak, "Manawahua," is given on the map as 2450. It has doubtless suffered much degradation by weathering. It seems, therefore, quite safe to estimate the depth of the coral at Barber's Point at 2500 feet.

As to the method of formation of coral reefs, that is very fully and well treated in many books on the subject. A coral reef seems to be an accumulation of the debris of various corals and shells beaten by the heavy surf to powder, and cemented by the sea-water. A gradual accretion grows up as the land subsides beneath it, forming first a "fringing" reef, and later, if fresh water from the land interferes with marine growth at the shore, forming a "barrier" reef. There being little fresh water from the adjacent mountain, only a fringing reef was formed at Barber's Point, many miles in width and of great solidity.

The formation of such reef on the western shore along Waianae seems to have been prevented by the violence of the westerly

gales, from which was well sheltered the bay between the Waianae and Koolau mountains.

Of the cause of subsidence of volcanic islands, which seem to be very general in their history, I know of no theory except that their weight tends gradually to press down the earth's crust.

How Oahu came later to undergo a slight elevation, seems to me attributable to some influence of a widespread disturbance of equilibrium of land and sea attendant upon the retiring of the ice-cap at the close of the last glacial period. Such disturbance is farther indicated by the brief explosions about the same date of the series of tuff cones along the southern coast of Oahu, including Salt Lake, Diamond Head, Koko crater, and others. Artesian borings establish the fact that Punchbowl was thrown up before the elevation of the reef, and the rain of black sand (volcanic ashes) covering Honolulu after that elevation. Quite certainly Diamond Head came after the reef was elevated.

I should tentatively guess the age of that elevation to have been 12,000 or 15,000 years ago.

Dr. Dall of Washington, observing the shells found in the ancient coral of our reefs, assigned them to the later Tertiary.

I should guess the age of our Koolau range to be much beyond one million years, and Waianae to be 50 per cent older. The coral reef may have begun to accumulate before the lavas ceased to flow, although most of it must be later than the extinction of the volcanic activity.

This sketch of the subject has perhaps unduly extended itself. Thanking you for calling forth the enjoyment experienced in writing it, I remain,

Most sincerely yours,

SERENO E. BISHOP.

AYRSHIRE CHAMPION.

Lily of Willowmoor, 22269, bred and owned by J. W. Clise, Redmond, Washington, has just finished her fifth consecutive official record for advanced registry, making a cumulative record of 84,991 lbs. of milk, and 3362.35 lbs. of fat with 3.84% fat average for the five years, making her the five-year champion of the breed.

This record is worthy of study, in that it shows to a remarkable degree the staying quality of the Ayrshire cow. Giving an average of 16,991 lbs. of milk and 672.47 lbs. of fat for five years, she now stands in first place as a long term cow.

She is due to freshen October 12, and had she not been bred to calve within the cumulative requirement she would undoubtedly have again led the world's Ayrshire record for a single year, as her record under these conditions is only 426 lbs. of milk less

than the present record of the world's champion Ayrshire for milk and is 37.96 lbs. more fat.

The record is valuable as showing the constitution necessary to give a remarkable milk and butter fat record, with a calf each year for five consecutive years. To give that amount of milk annually and raise a calf each year, a cow must have constitution, which is characteristic of the Ayrshire breed.

C. M. WINSLOW,

Sec. Ayrshire Breeders' Association.

Brandon, Vermont.

COMPLETE DIETARY OF PLANT DESIRABLE.

The Gardeners' Chronicle, referring to this subject, says that though we know that plants require certain elements of mineral plant food such as phosphorus, sulphur, potassium, lime, magnesium and iron, we have yet to discover what others are necessary for their healthy development. Recent experiments conducted by M. Maze with all possible precautions indicate that in the case of maize in addition to the above, manganese, zinc, silicon and cerium, as well as boron, aluminum, fluorine and iodine, are also found necessary. Traces of these latter occur in spring water, and when water, purified by repeated distillation, was used, the complete development of the plants failed.

On general grounds, says the paper referred to, we may conclude that what holds good for maize may also be found applicable to other plants as well. It is a matter not merely of scientific interest but (what is more important) of economic importance that the complete dietary of the plant should be established.

TREE CUTTING UP-TO-DATE.

For some time it has been known that a wire drawn tight and heated by an electric current red hot would cut its way through a thick tree. Mr. Hugo Gautke, a German inventor, has improved this process by causing the wire to become incandescent simply by friction in working its way through a tree. A steel wire one-twenty-fifth of an inch in diameter is used, and it is said that this can be made to traverse a tree twenty inches in diameter in six minutes. The wire is worked to and fro rapidly by an electric motor and becomes so hot by friction that it burns its way quickly through the trunk. The wire will cut through the tree without the use of wedges to keep the cut open, and the cut may be made several feet up the tree, on the ground level, or even below the ground. The electricity may be brought to the forest from a distance by a cable; a gasoline motor of 10-horsepower and a dynamo are all that is required to use this process. It is contended that the great trees, ten feet thick in the forest on the west coast, can thus be felled with ease.

FARMERS' INSTITUTES.

Statistics of farmers' institutes in the United States for 1914 are found in U. S. department of agriculture bulletin No. 269, just received. William Weinrich Jr. is secretary and treasurer of the institutes for Hawaii, but as this Territory is noted with "no report," the presumption is that the movement, like many others in this easy-going sub-tropic domain, lacks vitality. For the entire Union, in the year mentioned, 1-day meetings were—general 5554, women 724, young people 241; 2-day meetings—general 1791, women 128; 3-day or more meetings—general 155, women 28; number of institutes—general 7740, women 880, young people 241; total number days institutes—general 9601, 19,431, women 1451, young people 60; total attendance all sessions—general 2,964,769, women 78,237, young people 7145. Funds appropriated—by the States \$382,364.27, by colleges and from other sources \$67,518.37; total cost \$447,897.51, cost per session \$20.43; appropriation for 1915 \$363,550.

Total number of lectures on State forces, 1287; members of agricultural college and experiment station staffs engaged in institute work, 528; days contributed to work by last-mentioned, 7142; State lecturers giving instruction at teachers' institutes 107, at high schools 348, at normal schools 26, at common schools 200. Copies reports of proceedings published, 279,000. Movable schools—number 219, days 1464, registered attendance 112,498; railroad specials—number 34, stops 1141, miles 17,766, number of lecturers 156, attendance 474,906. Independent institutes—number 1643, sessions 1513, attendance 345,509. Round-up institutes—number 21, sessions 362, attendance 85,189. Picnics, fairs, conventions, etc.—number 635, sessions 817, attendance 90,735. Field demonstration meetings—number of experts 185, days of service 40,084. Total attendance, 1,127,803.

FAILURE THAT PROMISES SUCCESS.

The Garden Island has the following comments to make concerning failure of the Kuiaha homesteaders to make a living growing pineapples for \$11.25 per ton when it costs about \$15 per ton to raise the fruit:

"Maui is fretting just now over what seem to be indications of the failure of the Kuiaha homesteading project. It appears, from all accounts, that the homesteaders in this once promising area have become discouraged and, while they are not disposing of their lands, are leaving there to seek a livelihood elsewhere.

"Before this case is heralded abroad as another failure of homesteading in this Territory, we would like to see it thoroughly investigated. On Kauai we do not understand why localities so favorable to homesteading as Kuiaha was supposed to be should not have brought success to the settlers there. Kalaheo,

on this island, was never so promising; yet, look at that region today. From one side to the other and from the mountains almost to the sea you find only success and enthusiasm. Wai-pouli and the neighborhood thereabouts is a newer homestead region, but the people there are going about their plans with fair enthusiasm and, under average circumstances, their success is reasonably assured.

"The trouble at Kuiaha may be with the homesteaders themselves and not with the land, nor with the blights, nor the water, nor the market. Practical farmers are essential to success in any homesteading project, and, if Kuiaha has not had those, the secret of the apparent failure of the enterprise is uncovered right there.

"At any rate, the matter should be investigated. The Territory should know just why homesteading is a failure at Kuiaha, while proving all of a success at Kalaheo, for instance."

In the first place Kuiaha has not yet "failed," and to many the belief is daily growing that the future for this most favored district is brighter than ever. And the coming success will be on a much more substantial basis than pineapple culture alone could ever promise. In the second place, the Kauai homesteads are comparatively new. Their hope is based almost solely on pineapples. It is scarcely likely that they are growing them at a profit, either, under prevailing prices, though their owners possibly don't know it yet. But they will when they come to balance up the returns of several crops with what they have spent.

Pineapples will probably always play an important part in the Kuiaha district; but they will not be the sole dependence of the homesteaders. It is extremely doubtful if any one crop proposition on an average-sized homestead lot will ever pay, Kauai's evident belief to the contrary notwithstanding. But things have already been done in the Kauhala district that apparently solves this problem. There seems little doubt that Kuiaha will make good—if not all the original would-be farmers, at least a part of them, together with the newcomers who will take their places. The fact that Kuiaha got bumped so promptly in the pineapple game is probably a blessing in disguise, not only for the homesteaders themselves, but for the future of diversified agriculture in all Hawaii as well.—*Mau News*.

NEW TYPES OF TOBACCO.

At the meeting of the Committee of Agricultural Experiments at Peradeniya on May 13 and of the Ceylon Agricultural Society at Kandy on May 25, samples of tobacco grown and prepared at the government trial ground, Jaffna, by Mr. Scherffius, the government tobacco expert, were exhibited for the first time. They comprise types of all the five general classes of tobacco, namely—cigarette, pipe, chewing, cigar wrapper and cigar filler,

so far successfully grown in one small plantation; a most exceptional result to have been achieved due, Mr. Scherffius considers, to the particularly suitable soil and climate of the Peninsula. Special interest attaches to them, as leaf of like quality has probably never before been grown in Ceylon. They demonstrate that leaf suitable for the European market can probably be grown in Ceylon and if so they may prove the beginning of a new industry in the island. Mr. Scherffius, who comes from Lexington, Kentucky, the center of the White Burley district, where a hundred million pounds of it are produced annually, has expressed the opinion that the White Burley leaf just produced in Jaffna is equal in texture to and better in color than the average produced in its original home in America. This is all the more significant when it is remembered that it is only in a very limited area in the States that White Burley can be successfully grown. This pipe and chewing type is very easily cured, requiring no artificial heat or fermentation, but it will not stand heavy manuring. We must await reports from England before being able to speak as to flavor. We can perhaps grow tobacco through a range of 4000 feet elevation, so we could probably produce several of the market grades enumerated above.—*Tropical Agriculturist*.

ALKALINITY AND ACIDITY.

Alkalinity in soils is caused by presence of lime salts, and in a few cases, particularly near streams of alkaline bore water, to soda carbonate. A slight alkalinity is favorable, but too much alkalinity may be detrimental to plant life. For this reason alkaline bore waters are not suitable for irrigation, although quite fit for watering of stock. To some extent alkalinity can be improved by the application of gypsum.

Acidity in soil is caused when little or no lime is present in the soil, to neutralize the acidity formed by decaying vegetable matter and the natural acidity of some weathered rocks. Too high an acidity is detrimental, and can be improved by the application of lime in the form of slaked lime (burnt lime air-slaked).—*Queensland Agricultural Journal*.

BY AUTHORITY.

PERMITS TO START FIRES REQUIRED.

Notice is hereby given that, in accordance with Section 497 of the Revised Laws of Hawaii of 1915, fires to clear land, including the burning of fallows, stumps, logs, brush, dry grass or fallen timber, shall not be started for the period from the date hereof until November 30, 1915, on any land in North Kohala, Hawaii, from the northern boundary of the land of Kawaihae I to and including the land of Kaauhuhu, unless written permission has first been obtained from District Fire Warden S. P. Woods, Mahukona P. O., Hawaii.

The law requires that "such fires shall not be started during a heavy wind or without sufficient help present to control the same, and the fire shall be watched by the person setting the same, or by competent agents of his, until put out."

Honolulu, Hawaii, September 22, 1915.

C. S. JUDD,
Chief Fire Warden.

BY AUTHORITY.

BIDS FOR FOREST FENCING.

Scaled bids marked outside, "Bids for Forest Fencing, Olaa, Hawaii," and addressed to the Superintendent of Forestry, P. O. Box 207, Honolulu, Hawaii, for the construction of a stock-proof fence around Section B of the Olaa Forest Park Reserve, at 29 Miles on the Volcano Road, Puna, Hawaii, will be received up to and including October 20, 1915. Specifications may be obtained on application from the undersigned.

C. S. JUDD,
Superintendent of Forestry, Board of Agriculture
and Forestry,
Honolulu, Hawaii, October 1, 1915.

BY AUTHORITY.

SALE OF AWA ROOT.

Scaled bids marked outside, "Bids on Awa Root, Hamakua Pali Forest Reserve," and addressed to the Superintendent of Forestry, P. O. Box 207, Honolulu, Hawaii, will be received up to and including October 16, 1915, for an unestimated amount of awa root on government lands in the Hamakua Pali Forest Reserve, Hawaii. Bids to be based on the dry weight of awa root per pound and to be accompanied with a check for \$25. Deposit to be placed to credit of successful bidder or returned if bid is rejected. For copy of sample agreement and bend address the undersigned.

C. S. JUDD,
Superintendent of Forestry, Board of Agriculture
and Forestry,
Honolulu, Hawaii, October 1, 1915.

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The Board of Commissioners issues for general distribution to persons in the Territory, annual reports, bulletins, circulars, copies of its rules and regulations, and other occasional papers, which may be had, free, upon application.

A complete list of the publications of the Board available for distribution (together with the titles of certain issues now out of print) is to be found on the cover of the last biennial report.

Applications for publications should be addressed to the Mailing Clerk, P. O. Box 207, Honolulu, Hawaii.

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The Division of Hydrography has on hand free publications relative to the water resources of the Hawaiian Islands. These publications furnish detailed data as to daily, monthly, mean, maximum, and minimum run-off of streams and ditches, and also cuts and maps pertaining to the different islands. These publications will be mailed free of charge on request.

The records and maps of this division are available for inspection by any one who desires information relative to water resources, topography, etc. Blue print copies of hydrographic data relative to any stream, ditch, spring, etc., which may be under observation by this division will be mailed free of charge on request.

G. K. LARRISON,
Superintendent of Hydrography.

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The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

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All communications in regard to seed or trees should be addressed to David Haugis, Forest Nurseryman, Box 207, Honolulu, Hawaii.

C. S. JUDD,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent of Entomology.

THE HAWAIIAN FORESTER AGRICULTURIST

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NOVEMBER, 1915.

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TIMBER PRODUCTION FROM UNREMUNERATIVE LAND.

In Bulletin No. 153 of the U. S. Department of Agriculture, entitled, "Forest Planting in the Eastern United States," the following occurs on page 4:

"As the soil in portions of the hardwood regions deteriorates under cultivation, larger and larger areas will find their best use in the production of timber. In Indiana alone some 6,000,000 acres are at present unproductive."

Through an unfortunate choice of the word "unproductive" and the term "deteriorates under cultivation" this passage is both inaccurate and misleading, since the area of 6,000,000 acres in Indiana referred to is unproductive merely in the sense of not bringing any returns from cultivated crops. Nor is deterioration in the soil making a large area of farm land in Indiana unsuitable for cultivation and adapted only to the production of timber, as the two sentences, taken together, might seem to imply.

Where land is low in value and has proved unremunerative, redirection of the farming methods should first be considered. If reasonably satisfactory returns can not be obtained from general or special farming, live stock production, etc., the advisability of planting the cheaper lands with timber may well be considered.

[The foregoing are the contents of an official leaflet just received.—Ed.]

Prof. MacCaughey's papers—one of which, on woody plants of Oahu lowlands, appears in this number—help in bringing the work of the College of Hawaii into broader effectiveness.

Mr. Cooke's article in this number, on his system of cattle breeding, is a good example of how important agricultural interests of the Territory may be brought into beneficial discussion.

Mr. Judd, the executive officer of the Board of Agriculture and Forestry, has come to the assistance of the editor in a manner that ought greatly to increase the value of this magazine. He has written to the chiefs of divisions requesting them, at convenient intervals, to contribute articles to the Forester upon subjects within their special purview. While there is a great deal

of information useful to agriculturists and stock raisers in the monthly reports of divisions, it is often more casual than direct and is not always in arrangement and form such as to have its due instructional effect.

A statement by Dr. H. L. Lyon, of the sugar planters' experiment station, in the Hawaiian Planters' Record for September last, regarding fertilizers for pineapples has constrained the Pacific Guano and Fertilizer Company to republish, from the Forester and Agriculturist for May, 1911, the concluding installment of Mr. Carlton C. James' serial article on the subject. The article just mentioned gave the results of elaborate experiments in pineapple fertilization, together with positive conclusions thereon, and it was copied and quoted in tropical agricultural magazines all over the world. Naturally, therefore, it was not pleasing to the company whose laboratory expert had produced such a treatise when a contemporary published a declaration that, so far as he had been able to determine, "no reliable data has ever been worked out on which to base the mixing of proper fertilizers for pineapple growing on the various types of Hawaiian soils, or any other soils for that matter."

DIVISION OF ANIMAL INDUSTRY.

Board of Commissioners of Agriculture and Forestry.

GENTLEMEN:—I have the honor to submit herewith a report of the Division of Animal Industry for the month of August, 1915.

TUBERCULOSIS CONTROL.

The following dairy herds received the tuberculin test during the past month:

	Total.	Passed.	Con- demned.
Frank Madeiros	20	20	0
P. Miyakawa	13	13	0
K. Inouye	42	41	1
F. K. Makino	5	5	0
K. Onamoto	10	10	0
S. Tsudo	21	21	0
J. W. McGuire.....	12	11	1
S. I. Shaw	41	33	8
Chris Holt	15	14	1
Alexander Young	41	40	1
M. Reidel	9	9	0
K. Oshiro	17	16	1
Kamehameha Schools	29	29	0

	Total.	Passed.	Con- demned.
W. P. Louis.....	12	11	1
Frank Correa	13	13	0
S. M. Damon	312	305	7
S. Hiarata	32	30	2
K. Yamashita	34	32	2
M. K. Young	42	42	0
M. P. Robinson	2	2	0
E. Glade	1	1	0
E. M. Taylor	4	2	2

From the above tabulated list it will be seen that a total of 727 head of cattle were tested, out of which number 700 were passed and tagged and 27 condemned and branded. Of the 27 condemned cows, 14 have already been slaughtered. The remaining ones are segregated awaiting slaughter.

Two trips of inspection were made to the Wahiawa slaughter-house. This slaughter-house has for some time been buying up cattle condemned at different dairies. Permission was granted to slaughter these condemned animals at Wahiawa provided that such animals be kept in an enclosure sufficiently isolated to prevent all possible spread of infections and that the carcasses received competent inspection before being sold for human consumption.

The abattoir occupies an isolated position, there being no cattle pastured anywhere near it, and, if properly handled, will provide a convenient means of disposing of cattle condemned in the different dairies. At the time of the last inspection some irregularities were noticed which were at once brought to the attention of the manager and have since been rectified.

HOG CHOLERA.

Reports of losses from hog cholera have entirely ceased and it is confidently assumed that this last and severest outbreak has been checked. With an intelligent and liberal use of anti-hog cholera serum such losses need never to be experienced again. It is to be hoped that experience gained by the different hog raisers during this outbreak will induce them and all others in the business to report immediately any symptoms among their herds which in any way approach those of hog cholera.

Two official inspections were made at Pond's pig farm, where conditions appear to be greatly improved. All losses which can in any way be attributed to hog cholera have ceased, larger litters are being farrowed, and a greater percentage of the young are being raised, which last is due to more intelligent feeding of the sows at farrowing time and greater care of the young at time of birth.

In consideration of the improved conditions at the farm, permission to ship hogs to the Honolulu market was granted and so far two shipments have been made, one of 20 head to the Hawaii Meat Co. and one of 21 head to C. Y. Hop Co. Both ante-mortem and post-mortem examinations have been made on all of these hogs which have been slaughtered, and not the slightest indications of cholera have been met with in any of the internal organs.

IMPORTATIONS OF LIVE STOCK.

Wilhelmina, San Francisco: 35 cases poultry.

Manchuria, San Francisco: 1 dog, Wells Fargo Ex. Co.

Manoa, San Francisco: 18 cases poultry, 2 cases pigeons.

Mongolia, Orient: 5 parrots, F. T. P. Waterhouse; 2 dogs, 17 Japanese bantams, Benj. Hegie; 1 honey bear, 2 monkeys, Col. Sam Johnson.

As the point of origin of the above bear and monkeys was Singapore, which has always been considered and included in the tabu district of which the Philippine Islands are a part, the animals were placed in mosquito-proof quarantine awaiting decision from the Federal Bureau of Animal Industry, Washington, regarding a landing permit.

Matsonia, San Francisco: 23 cases poultry.

Makura, Vancouver: 1 English bull dog, E. O. White.

Lurline, San Francisco: 9 crates poultry; 1 Duroe Jersey boar, Club Stables; 39 mules, Schuman Carriage Co.; 2 Jersey bulls, W. E. Bellina; 1 dog, Capt. Madsey; 14 brood mares, F. F. Baldwin, Kahului.

Wilhelmina, San Francisco: 11 crates poultry.

Respectfully submitted,

L. N. CASE,
Assistant Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

Board of Commissioners of Agriculture and Forestry.

GENTLEMEN:—I respectfully submit my report of the work performed by the Division of Entomology for the month of August, 1915, as follows:

During the month 48 vessels arrived at the port of Honolulu, of which 20 carried vegetable matter and one vessel brought moulding sand. Of these vessels 12 passed through the Panama Canal.

Disposal.	Lots.	Parcels.
Passed as free from pests.....	1440	25,172
Fumigated	17	96
Burned	42	54
Returned	6	6
<hr/>		
Total inspected	1505	25,328

Of these shipments, 25,050 packages arrived as freight, 137 packages as mail matter and 141 packages as baggage of passengers and immigrants.

RICE AND BEAN SHIPMENTS.

During the month 43,174 bags of rice and 3201 bags of beans arrived from Japan and Oriental ports which, after a thorough inspection, were found free from rice and bean pests and were passed for entry into the Territory.

PESTS INTERCEPTED.

Thirty-one packages of fruit and 9 packages of vegetables were taken from the baggage of passengers and immigrants from foreign countries and destroyed by burning. A passenger from Japan had a box full of land-dwelling hermit crabs, and, as none of such exist in these islands, they were seized and were put in a jar with alcohol as preservative. One package of chestnuts found in Japanese baggage was infested with weevils and was fumigated. Three packages of garden peas came by mail from Japan which were found infested with the pea weevil and were also treated to fumigation. A shipment of orchids arrived from Singapore on August 3. A few of the plants were infested with the striped mealybug (*Pseudococcus virgatus*). In the packing, which was destroyed by burning, was found an ants' nest (*Tetramorium guineense*), a corabid beetle, a cockroach, a dermested beetle and a few spiders and millipeds. Another shipment of plants from Singapore was infested with mealy bugs and scale insects and in the packing was a leaf-eating beetle and some ants (*Prenolepis species*). A shipment of palms from Singapore was free from pests, but in the soil we found an ants' nest (*Tetramorium guineense*). A case containing samples of various hard woods from the same locality was fumigated as a precautionary measure. Five lots of seeds and plants from foreign countries were returned as unmailable under ruling of the Federal Horticultural Board of Washington, D. C., as was also an orchid brought from the Philippines by an officer of the transport.

BENEFICIAL INSECTS.

Mr. Fullaway sailed from Honolulu on July 25 on the S. S. Chiyo Maru for India via Hongkong, in search of a parasite of the melon fly, and the work of breeding and distribution of the various parasites of the fruit fly, horn, house and stable flies is being continued under my supervision. During the month of August the following parasites of fruit fly were reared:

<i>Tetrastichus giffardii</i>	28,000
<i>Diachasma fullawayi</i>	1,719
<i>Diachasma tryoni</i>	795
<hr/>	
Total bred	30,514

The following colonies were liberated:

<i>Tetrastichus giffardii</i>	26,500
<i>Diachasma fullawayi</i>	1,703
<i>Diachasma tryoni</i>	711
<hr/>	
Total liberated	28,914

In addition to the above the following parasites of the horn, house and stable fly were liberated:

African spalangia	2000
Philippine spalangia	2000
African horn fly parasite.....	1800
Philippine pteromalid	1700
<hr/>	
Total liberated	7500

The grand total of all liberations of parasites, including large numbers of *Opius humilis*, exceeded 36,414 individuals.

On my return from California I brought a very large colony of a mealy bug parasite (*Leptomastix histrio*) which was presented to the Board of Agriculture and Forestry by Mr. Harry S. Smith, superintendent of the California State Insectary. From this lot I have been able to liberate in favorable localities 125 individuals, with prospect of liberating many more during the coming month. This parasite originally came from Sicily, Italy, and promises to be efficient in checking the citrus mealy bug and other species. From the material brought I have been able to start seven breeding jars for future rearings. The parasite is very minute, but very active, and is said to complete its life cycle in from 24 to 36 days.

Several lots of inoculated Japanese beetles have been distributed. Much complaint has reached this office of the damage

being done at this time by the Japanese beetle, the prolonged dry spell having no doubt a great bearing on the marked increase of this pest.

HILO INSPECTION.

During the month of August Brother Newell reports the arrival of seven steamers and one sailing vessel at the port of Hilo. Five steamers brought vegetable matter, consisting of 213 lots and 3169 packages. Of these shipments 15 boxes of apples were destroyed on account of being badly infested with worms. The T. K. K. steamer Kiyō Maru arrived direct from Japan bringing 4420 bags of rice, 320 bags of beans and 3 bags of sesam seed, all of which was passed as free from pests.

INTER-ISLAND INSPECTION.

During the month 63 steamers plying between Honolulu and the other islands were attended to. The following shipments were passed:

Taro	487 bags
Plants	102 boxes
Fruit	32 boxes
Vegetables	41 boxes

Total inspected 662

The following packages were refused shipment on account of infestation or of having soil attached to the plant:

Plants	16 packages
Fruit	28 packages

Total refused 44 packages

On August 17 Dr. L. C. Howard, chief of the Bureau of Entomology, Washington, D. C., arrived from the mainland. This was his first visit to Hawaii, and every one of the local entomologists did all possible during his week's stay to show Dr. Howard the work accomplished here which has given Hawaii fame the world over. I am sure that Dr. Howard left these islands favorably impressed with our work and pleased with having paid Hawaii a visit.

Respectfully submitted,

E. M. EHRLHORN,
Superintendent of Entomology.

DIVISION OF FORESTRY.

Honolulu, Sept. 29, 1915.

Board of Commissioners of Agriculture and Forestry.

GENTLEMEN:—I respectfully submit the following routine report for the Division of Forestry for the month of August, 1915:

HAWAII TRIP.

The first six days of the month were spent on Hawaii finishing up an official investigation of several matters which required attention. One of these was the proposed elimination of a portion of the land of Humuula in the Hilo forest reserve for homesteading purposes. As pointed out in my special report of August 14, which has been approved by the board, the land in my opinion is necessarily a part of the reserve and should not be eliminated.

While investigating Humuula I had a chance to make a personal study of the situation on the government land of Piha, also in the Hilo reserve, which involves the question of whether a destroyed forest should be released for stock grazing or protected by fencing and allowed to come back into heavy forest. Since there is much further information in regard to fencing and the present uses of adjacent land which must be obtained in order to decide on a course which will be wisest in the long run, I desire to investigate still further before presenting my final recommendation to the board.

The Olaa forest park reserves, Sections A and B, along the Volcano road were examined and it was ascertained that they were both in need of protection by fencing. Section A includes the last large section of native ohia and tree fern forest along the road at 24 Miles, and about 5.6 miles of fencing are needed to protect it from cattle and other destructive animals. The government surveyor has already been requested to locate and flag the boundaries preparatory to fence construction. Section B is the koa grove at 29 Miles, reserved at the time when the Olaa summer lots were laid out, and is a scenic attraction to tourists. Here a pig-proof fence is necessary to give adequate protection, and a call for bids for the construction of a fence .44 mile long, according to specifications approved by the board, is being advertised. The B. P. Bishop Estate has signified its willingness to co-operate to the extent of paying one-half the cost of the fence along the reserve where, for a distance of 707 feet, the boundary adjoins the estate land of Keauhou.

The last area visited on Hawaii was at Kapapala, where it has been requested to add 270 acres of government land to the Kau forest reserve. Coöperative tree planting is proposed for

this land, and I am at work on a plan which will be presented to the board as soon as completed.

PROPOSED FOREST RESERVE AT MOKULEIA.

Two days were spent on the government land back of Moku-leia, Oahu, examining the forested area with a view to the creation of a forest reserve there. This is one of the projects that my predecessor was not able to complete before he left Hawaii. I found an excellent forest somewhat damaged by cattle, which have gone almost everywhere through it. Showers from Kaala pass over the area and with proper protection the forest can be made to serve more efficiently as a conserver of water in this region, where water in the springs is necessary for stock on the foothills and in artesian wells for irrigation on the lowlands near the sea. Mr. W. W. Goodale, manager of the Waialua Agricultural Company, has kindly offered to coöperate in this project by having his surveyor mark out the boundary line between the government land on the north slopes of Kaala and the private lands makai.

TREE PLANTING.

Advice was given Mr. A. A. Wilson, the new manager of the Wahiawa Water Company, on tree planting around the Wahiawa reservoir on Oahu, and he has already begun the work by setting out 400 lemon-scented gum trees which he ordered from the government nursery.

The government land of Aiea, in the Ewa forest reserve, Oahu, was visited in company with Mr. W. P. Jarrett, who has applied for and been given permission to clear away the grass and plant trees on the reserve adjacent to his homestead lot. This will be a benefit to both parties, for it will remove the fire menace to the house which Mr. Jarrett is building and the government will have several acres of the reserve planted to native koa and kukui trees without cost.

CATTLE HUNTING ON MAUNA KEA.

During the month applications were received from a Russian and a Portuguese to hunt wild cattle on the north side of the Mauna Kea forest reserve. Upon investigation I found that in order to reach this reserve the lands of the Parker Ranch or of the Kukaiau Ranch must be crossed, and that this is objectionable because hunters are careless in closing gates and their dogs harass tame cattle. Moreover, the custom here has been for the neighboring ranchers to hunt in the Mauna Kea reserve for wild cattle, that really belong to them, and I am informed that there are not many wild cattle left in this part of the reserve. Under the circumstances I thought it unwise to grant the applications.

FOREST FIRES.

During the month a grass fire was reported to have occurred in North Kohala, Hawaii, in which three government pastoral lands below the forest were burned over in addition to some private land. The person responsible for starting the fire was arrested and convicted and required to pay the cost of extinguishing it.

A rather severe forest fire, which burned over several hundred acres, occurred the latter part of the month on the U. S. military reservation at Waianae-uka. It started several days previously and was thought to have been extinguished by regular troops five or six times, but burning in the roots of trees underground it would break out again and, fanned by the strong wind, would speedily run up the slopes covered with dry grass and ferns. On August 31 I visited the fire with the deputy fire warden and found that everything possible was being done by the military to suppress the conflagration. It was finally extinguished by 2500 soldiers from Schofield Barracks who fought it with wet bags with difficulty on the steep mountain slopes.

On August 29 there was a grass fire at Maili, in the same general region, which was soon extinguished by men from the Waialua plantation assisted by federal troops from the reservation.

SEED COLLECTION.

Attention is called to the fact that all of the seed needed in raising the popular tree seedlings in large quantities at the government nursery is collected locally by our own seed boys. With some kinds of seed this means a great saving of expense. An instance of this is the lemon-scented gum (*Eucalyptus citriodora*), which formerly we had to buy in California for \$2 per ounce. During the month the seed boys cut a tree of this species on Tantalus where it was crowding other trees, and gathered from it one and a half pounds of good seed, worth \$40.

It has been very difficult for some time to obtain good koa seed on account of a weevil which almost universally seems to infest all koa seed pods. As pointed out in the report of the forest nurseryman, through the kindness of Mr. Frank Greenwell we have been able to secure a limited amount of koa seed from Kona which will tide us over for another year.

ARBOR DAY.

Mention is made here of the approach of Arbor Day, which, as usual, will be celebrated some day in November soon to be announced by the Governor. The nursery on this island and the sub-nurseries on Kauai and Hawaii are preparing for the event by getting ready a large stock of young trees for distribution,

and it is planned to make the day an unusual event this year by the planting of a greater number of trees than ever before.

Respectfully submitted,

C. S. JUDD,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, Sept. 29, 1915.

Superintendent of Forestry.

DEAR SIR:—I herewith submit a report of the principal work done during the month of August.

Nursery.

Distribution of Plants.

	In Seed Boxes.	In Boxes Transplanted.	Pot Grown.	Total.
Sold	725	54	779
Gratis	300	721	1021
	—	—	—	—
	..	1025	775	1800

Collections.

Collections on account of plants sold amounted to.....	\$ 6.15
Refund on payment to Sakamoto for rent of land in Kona in connection with parasite work.....	45.00
	<hr/>
	\$51.15

Plantation Companies and Other Corporations.

Under this heading 30,000 trees in seed boxes were distributed, 25,000 of which were part of an order received about a month ago for 50,000. The balance of this order will be delivered early in September.

Collection and Distribution of Seed.

Mr. Frank Greenwell of Kailua, Kona, has presented the division with over two pounds of koa seed. This donation is very acceptable, as we were entirely out of the seed mentioned. We will have enough now to carry us over to the next seeding season.

The two seed boys are kept busy collecting seed of forest and other trees.

We are in receipt of a number of requests from botanic gardens and other institutions for seeds, and we are forwarding samples to all with the understanding that we receive seed in return when desired.

Makiki Station.

The work at this station has been principally routine. A large stock is now ready for the planting season as well as for Arbor Day, which takes place about the middle of November.

Honolulu Watershed Planting.

During the month 481 kukui trees were planted out in Herring valley. A large number of holes are also ready for koa trees on the higher slopes. Hoeing and clearing away of grass from the trees will have to be done during September.

Advice and Assistance.

Under this heading the writer has been called upon to give advice and assistance as follows:

Calls made in and around city, 10; by telephone, 15; at nursery, 8; by letter, 8. Total, 41.

Respectfully submitted,

DAVID HAUGHS,
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

Honolulu, Sept. 10, 1915.

Board of Commissioners of Agriculture and Forestry.

GENTLEMEN:—The following report of operations of the Division of Hydrography during the month of August, 1915, is submitted:

WEATHER CONDITIONS.

The rainfall was considerably below normal practically all over the Territory, and streams and ditches are showing very little discharges. Kauai seems to have suffered the least, and Hawaii the most. All streams on Oahu are very low and the reservoirs have been drained to a very low level. The deficiency in rainfall has not been so marked in the Nuuanu valley as elsewhere, but the city water supply reservoirs are gradually being depleted. No. 4 Reservoir has but 19 feet of water in it.

LEGAL WORK.

G. K. Larrison spent nearly all of the month of August at Waimea, Hawaii, assisting the Attorney General's department on the Waikoloa water case being tried at that place.

KAUAI.

Construction work on the three new stations being established in the Waimea gorge on the three main branches of the Waimea river was started. In addition to this work 32 stream and seven rain-gaging stations were visited, and 14 stream measurements were made.

An examination was made of the Waimea water supply system and recommendations relative to its improvement were made to the health authorities.

OAHU.

In the absence of G. K. Larrison, R. C. Rice, office engineer, held a conference with His Excellency the Governor of Hawaii, relative to the leasing of government water in the vicinity of Anahola, Kealia, Kapaa and Lihue, on the Island of Kauai. Conferences were also held with His Excellency relative to the proposed expenditure of \$20,000 by a commission appointed by the Mayor of Honolulu to investigate the city's water resources.

A new garage with concrete floor, large enough to hold two automobiles, oil tanks and other equipment, was constructed on the premises of Judge C. W. Ashford, 1087 Beretania street, under an agreement that no rental is to be paid previous to July 1, 1917.

A large amount of minor repair and maintenance work was done on the stream, ditch and rainfall gaging stations on this island. Twenty-four stream and ditch and four rainfall-gaging stations were visited, and eleven stream and ditch measurements were made.

MAUI.

Thirty-eight stream and ditch and three rainfall-measurement stations were visited, and 16 stream measurements were made. In addition to this a considerable amount of small repair and maintenance work was done.

HAWAII.

Seven stream measurements were made on the Waikoloa stream, and a large amount of survey and level work was done—all in connection with the Waikoloa water case.

SEPTEMBER PLANS.

Kauai—Work will be continued on the construction of the three new Waimea stream-gaging stations. A special investigation and report to His Excellency the Governor relative to the government waters of the Anahola, Kapaa and Wailua streams will be made.

Oahu—The construction of new concrete controls on the two main branches of the Malaekahana, the Kahawainui, Wailele and Eoloa streams, on windward Oahu, will be started. Most of the expense incident to this work will be borne by the Kahuku and Laie plantation companies.

Maui—Sites of the proposed new stations on the Olowalu, Ukumehame and Lahainaluna streams will be selected, and routine maintenance and operation work done.

Very respectfully,

G. K. LARRISON,
Superintendent of Hydrography.

HOG CHOLERA MAXIMS.

(Weekly News Letter of U. S. Department of Agriculture.)

Hog cholera is most prevalent at this season of the year, and the department offers the following suggestions to those who are interested in combating the disease:

TO KEEP HOG CHOLERA OUT OF THE HERD.

1. Locate your hog lots and pastures away from streams and public highways, and do not allow the hogs to run free range.
2. Do not visit your neighbor or allow him to visit you, if either of you have hog cholera on your premises.
3. Do not drive into hog lots when returning from market or after driving on public highways.
4. Do not use hog lots for yarding wagons and farm implements.
5. Do not place newly-purchased stock, stock secured or loaned for breeding purposes, or stock exhibited at county fairs with your herd. Keep such stock quarantined at least two weeks, and use care to prevent carrying infection from these to other pens in feeding and attending stock.
6. Burn to ashes or cover with quicklime and bury under four feet of earth all dead animals and the viscera removed from animals at butchering time. They attract the attention of buzzards, dogs, etc., which are liable to carry hog cholera infection.
7. Confine your dogs and do not keep pigeons unless you confine them.

IF HOG CHOLERA APPEARS IN YOUR HERD.

Treat your hogs immediately with anti-hog-cholera serum, after which they should be kept on a light diet and pure drinking water and confined to limited quarters that may be cleaned daily and sprayed three times a week with 1 part of compound cresol solution to 30 parts of water until the disease has abated in the herd. To obtain the best results the serum must be administered before the disease has progressed in the herd.

TO RID THE PREMISES OF INFECTION.

Remove all manure and saturate with quicklime.

Burn all litter, rubbish, and old hog troughs.

After the premises are thoroughly cleaned, spray walls, floors, and other surfaces with disinfectant (1 part compound cresol solution to 30 parts water). Where hog houses are small, turn them over, exposing interior to sunlight.

Wallow holes and cesspools should be filled in, drained, or fenced off.

All runs underneath buildings should be cleaned and disinfected and then boarded up.

Destroy hogs that do not fully recover, as they may be carriers of cholera infection.

EQUINE STOCK STILL LARGE.

Much apprehension has been felt over the depletion of horse stock in the United States due to the export of horses and mules to Europe and Canada for war purposes. The following figures show, however, that this fear is not well founded:

Number of horses and mules inspected by U. S. Bureau of Animal Industry for export to Europe and Canada from August, 1914, to June, 1915—all months:

	Horses.	Mules.	Both.
To Europe	260,791	61,441	322,232
To Canada	41,260	24,120	65,380
	<hr/> 302,051	<hr/> 85,561	<hr/> 387,612

This total of 387,612 is less than one per cent of the total number of horses and mules in the United States. As a matter of fact, in spite of this exportation to Europe, the total number of these animals in the United States today is greater than it was a year ago, due to an increased production.

SOME COMMON WOODY PLANTS OF THE OAHU
LOWLANDS.

Editor Hawaiian Forester and Agriculturist.

SIR:—In connection with the College of Hawaii course in dendrology, which I give, I have found the accompanying reference list of much service. This is an alphabetical list, cross-referenced, of the commoner indigenous and cultivated trees, shrubs and woody plants that are to be found on the Oahu lowlands. It does not include species that are found only along the beaches, nor does it include many of the rarer horticultural trees. The list aims to cover only such trees and shrubs as one would be likely to find, for example, along a country roadway, outside of the city. The botanical names are those that have found general usage in the technical literature.

Very truly yours,

VAUGHAN MACCAUGHEY.

A REFERENCE LIST OF SOME COMMON TREES, SHRUBS AND WOODY
PLANTS OF THE OAHU LOWLANDS.

(Exclusive of littoral plants.)

- Acacia Farnesiana—*Klu* (naturalized).
- Ahuhu*—*Tehprosia pescatoria*.
- Aleurites moluccana—*Kukui* (native).
- Algaroba—See *prosopis juliflora*.
- Artocarpus incisa—Breadfruit, *Ulu* (Hawaiian).
- Bamboo—See *Bambusa vulgaris*.
- Bambusa vulgaris*—Bamboo, *Ohe* (introduced). There are several kinds.
- Banana—See *Musa*.
- Bestil—See *Thevetia neriifolia*.
- Breadfruit—See *Artocarpus incisa*.
- Cactus, Prickly Pear—See *Opuntia tuna*.
- Calophyllum Inophyllum*—*Kamani* (Hawaiian).
- Capsicum frutescens*—Chili pepper; red pepper (introduced). There are several varieties.
- Carica papaya*—Papaya (introduced).
- Cassava—See *Manihot utilissima*.
- Cassia Gaudichaudii*—*He-uhi-uhi* (native).
- Cassia occidentalis* (introduced)—There are numerous introduced Cassias.
- Castor-oil Plant—*Ricinus communis*.
- Casuarina equisetifolia*—Ironwood (introduced). There are several species.
- Cestrum* sp.—Inkberry.

- Citrus aurantium var. Sinensis—Common orange (introduced).
 ✓ Citrus Japonica—Kum-quat, Chinese orange (introduced).
 ✓ Cocos nucifera—*Niu*, coconut (Hawaiian).
 Coffea Arabica—Coffee (introduced).
 ✓ Cordyline terminalis—*Ti* or *Ki* (native).
 Cotton, Hawaiian—See *Gossypium tomentosum*.
 Date Palm—See *Phoenix dactylifera*.
 ✓ Dracaena aurea—*Hala-pepe* (native).
 ✓ Erythrina monosperma—*Wili-wili* (native).
 Eucalyptus robusta (introduced). There are numerous species of Eucalypto.
 Eugenia Jambos—Rose apple (introduced).
 Ficus Carica—Fig (introduced).
 ✓ Gossypium tomentosum—*Mao*, Hawaiian cotton (native).
 Guava—See *Psidium*.
 Grevillea robusta—Silky Oak (introduced).
 Hala—See *Pandanus odoratissimus*.
 Hala-pepe—See *Dracaena aurea*.
 He-uhi-uhi—See *Cassia Gaudichaudii*.
 Hibiscus Rosa-Sinensis—Common Hibiscus.
 Hibiscus tiliaceus—*Hau* (Hawaiian).
 Inga dulcis—Opium tree (introduced).
 Inkberry—See *Cestrum*.
 Ironwood—See *Casuarina*.
 ✓ Jambosa malaccensis—Mountain apple, *Ohia ai* (native).
 Kamani—See *Calophyllum inophyllum*.
 Kiawe—See *Prosopis juliflora*.
 Klu—See *Acacia Farnesiana*.
 Koa haole—See *Leucaena glauca*.
 Kukui—See *Aleurites moluccana*.
 Lantana Camara—Lantana (introduced).
 Lauhala—See *Pandanus odoratissimus*.
 ✓ Leucaena glauca—*Koa haole* (introduced).
 Manihot utilissima—Manioc. Cassava (introduced).
 Mao—See *Gossypium tomentosum*.
 Mangifera indica—Mango (introduced).
 Mango—See *Mangifera indica*.
 Melia Azedarach—Pride of India (introduced).
 Mexican Almond—See *Terminalia catappa*.
 Milo—See *Thespesia populnea*.
 Monkey pod—See *Pithecolobium saman*.
 ✓ Morinda citrifolia—*Noni* (Hawaiian).
 Mountain apple—See *Jambosa malaccensis*.
 Musa Cavendishii—Chinese Banana (introduced).
 Musa sapientum—Banana (some native and some introduced varieties).
 Nerium Oleander—Oleander (introduced).
 Niu—See *Cocos nucifera*.
 Ohe—See *Bambusa vulgaris*.

- Ohia ai*—See *Jambosa malaccensis*.
Olea Europaea—Olive (introduced).
Oleander—See *Nerium Oleander*.
Opium tree—See *Inga dulcis*.
Opuntia tuna—*Panini* (naturalized).
Orange—See *Citrus*.
Pandanus odoratissimus—*Hala, Lauhala* (Hawaiian).
Papaia—See *Carica papaya*.
Pepper—See *Capsicum*.
Phoenix dactylifera—Date Palm (introduced).
Pithecolobium saman—Monkeypod (introduced).
Plum, Chinese or Java—See *Syzygium Jambolana*.
Plumieria acutiloba—*Plumaria* (introduced).
Pride of India—See *Melia Azedarach*.
Prosopis juliflora—*Algaroba, Kiaze* (introduced).
Psidium cattleianum—Strawberry Guava (introduced).
Psidium guayava—Common guava (introduced).
Psidium pyrifera—*Waiawi* (introduced).
Phyllanthus roseopictus (introduced).
Ricinus communis—Castor-oil plant (introduced).
Rose apple—See *Eugenia Jambos*.
Salix Babylonica—"Chinese" willow (introduced).
Scaevola glabra—*Ohe-naupaka* (native).
Sesbania tomentosa—*Ohai* (native).
Silky Oak—See *Grevillea robusta*.
Spondias dulcis—*Wi* (introduced).
Strawberry guava—See *Psidium*.
Syzygium Jambolana—Java Plum (introduced).
Tehprosia piscatoria—*Ahuhu* (native).
Tamarindus indica—Tamarind (introduced).
Terminalia catappa—Mexican Almond (introduced).
Thespesia populnea—*Milo* (Hawaiian).
Thevetia neriifolia—Bestil (introduced).
Ti—See *Cordyline terminalis*.
Ulu—See *Artocarpus incisa*.
Waiawi—See *Psidium pyrifera*.
Wi—See *Spondias dulcis*.
Wili-wili—See *Erythrina monosperma*.
Willow—See *Salix Babylonica*.

A SYSTEM OF CATTLE BREEDING.

(By HON. GEORGE P. COOKE, Manager American Sugar Co.'s
Cattle Ranch, Molokai.)

The following system of cattle breeding has been evolved for our conditions; but it may be helpful in suggesting to other breeders a method or basis to work on. Our conditions under which we raise cattle may certainly be called dry, though we have a small section below the forest that raises good *paspalum* dili-

tatum, reu-top and Bermuda grass. Originally it was all open range, the cattle getting water from streams, water-holes or brackish springs along the shore. A general mixture of breeds had been used to a limited extent, Angus, Holstein, Devon, Shorthorn and Hereford blood showing in the herd. The basis of the herd, however, was light built, brindled, long-horned Mexican cattle. On taking over this ranch seven years ago we decided that under the conditions the Devon blood showed up best. That is, under the hard conditions the cattle showing the Devon strain of blood were the thriftiest. It was decided to build up the herd with the old Devon breed. We have a herd of over one hundred pure-bred Devons from which we raise our bulls for the general herd.

The range has been cut up into twelve pastures from 20,000 acres to 4000 acres, depending on natural conditions and whether annual grasses or perennial grasses are the principal feed. A system of pipe carries pure mountain water to all the pastures.

We plan to breed 2000 cows. Estimating a fertility of seventy-five per cent this would give us a branding count of 1500 calves (750 males and 750 females). Breeding the heifers to have their calves when three years old and to be in the breeding herd for four years, we will require five hundred heifers a year to go into the breeding herd. The remaining two hundred and fifty are spayed. Steers are marketed at three years old. Old cows culled from the breeding herd, before calving, have to rear their last calf, making them eight years old when ready to go to market. Thus in a year we expect to have for market 750 three-year-old steers, 250 spayed heifers and 500 old cows.

To carry out this system a series of ear-marks was adopted. Males are marked on the left ear and females on the right ear. The tip of the ear is modified to indicate the age.

Our * mark is this:

In 1909 calves were marked	full ear
" 1910 " " "	end cut off
" 1911 " " "	split
" 1912 " " "	upper corner out
" 1913 " " "	lower corner out
" 1914 " " "	same as 1909
" 1915 " " "	same as 1910

In this way as cattle come through the chute they can be readily separated either by sex or age.

The above is the theory or basis on which we work. In the practice of it judgment must be used, as it may prove more advantageous to throw out a barren three-year-old cow or a poor mother and retain for another year an old cow that is an excep-

* The author's diagram shows a concave mark in the middle lower edge of the ear lobe. This is the only mark of 1909 ("full ear"). It is repeated in the succeeding classes, with the respective additions described above in words.—Ed.

tionally good mother. We breed on the basis of one bull to every twenty cows for a period of four months.

When the Devon breed is thoroughly established we expect then to cross Shorthorn bulls on to the general herd. We do not believe in using cross-bred or grade bulls, but plan to use only pure bred. It is slow work to improve a mongrel herd with anything but pure-bred bulls, and one cannot get uniformity in his herd except with pure-bred bulls. In a large herd uniformity is most essential, as the cattle cannot be handled individually but in classes, viz., year-old heifers, two-year-old steers, etc.

CASSAVA IN BARBADOS.

Following is an extract from the official report on the Department of Agriculture, Barbados, 1913-14, just received:

"The cultivation of the different varieties of cassava obtained from Montserrat, Trinidad and Panama, together with a number of the varieties grown from seed, was continued again this year. There are twenty-four new seedlings, obtained during the year, under cultivation. The yields during 1913-14, with four exceptions, were not as high as those of the previous year. This is probably due to the drought experienced from November, 1913, on to the time the cassava was reaped in 1914.

"Every year, just before the rainy season is expected, a number of the peasants dig out their cassava roots so as to enable them to have the land ready when the rain comes to plant other crops. As fresh cassava roots do not keep very long after they have been dug they usually have to sell them at a low price, and later on often suffer for want of food before the crops which have taken the place of the cassava mature sufficiently to be reaped.

"As in some of the neighboring islands the peasantry manufacture their cassava roots into farine, cassava meal, cassava starch, cassava cakes and tapioca, a small manufacturing plant consisting of a mill, a press, and a farine pan with the necessary bags for pressing the grated roots, etc., was, with the kind permission of Mr. W. D. Shepherd, put into operation at Union Hall, which is situate in a district where there are probably more peasants growing cassava than in any other. Before the plant was sent to Union Hall, it was operated at Codrington House, where the Superintendent of Agriculture resides, so as to enable some of the members of the staff of the Department of Agriculture to obtain a knowledge of the manufacture of the articles mentioned above. This was done in order that one of them might be able to instruct the peasantry, etc. As manufactured cassava products like farine, cassava cakes, etc., will keep in good condition for some months, those who have availed themselves of the opportunity to work up their cassava roots should have a food supply sufficient to last them until, under normal weather conditions, their crops of Indian corn, sweet potatoes, etc., are available."

ROSA HUGONIS.

A New Hardy, Yellow Rose from China.

DAVID FAIRCHILD.

If you see a particularly beautiful picture hanging in a friend's house your first question is, "Who painted it?" yet how few of the people who visit a rose garden and admire the beauties of color and form ever realize that practically all of our cultivated double roses are almost as much the result of man's work as a picture is. These living forms have arisen from the greatest artificial mixing of species which man has been able to bring about by the process of hybridization.

Wild roses from all over the world have entered into their ancestry and made them what they are, so that to a rosarian the history of a rose's ancestry is quite as fascinating as is a family tree to a student of genealogy.

To create a rose which will delight thousands of people must be as keen and wonderful a pleasure as intellectual man can enjoy; long after he has crumbled to dust generations of beautiful women, happy children, old men and young lovers will bury their faces in its petals and forget for the moment all else but its beauty.

Next to this pleasure, perhaps, is the enjoyment that comes from finding a wild rose in some far-off land where it blooms unseen by cultivated eyes, and knowing that it will become the admired and loved garden treasure of a whole great civilized country.

I do not know if Father Hugo Scallan still lives or not, nor whether his life was a happy one, but if he is alive it would surely give him the keenest kind of pleasure to watch the career of a yellow rose which he found in China.

In 1899 he sent seeds of this rose to the British Museum, the authorities there sent it to the Royal Botanic Gardens at Kew—that great institution from which so many things of value have come into cultivation; and from Kew we obtained seeds for the United States. Very early each spring it blooms and it is yearly attracting the attention and arousing the enthusiasm of more and more flower-loving Americans.

Rosa hugonis is the name that has been given to this beautiful yellow rose that deserves a place in every dooryard in America. It is the earliest blooming of almost all the roses and earlier than any other yellow rose. It is of a lovely shade of yellow, is delicately perfumed and produces its single flowers in such profusion as almost to conceal the plant. It is perfectly hardy, not being injured by —22 deg. F., which cannot be said of most of the other yellow roses.



A NEW YELLOW ROSE FOR THE PLANT BREEDER.

Rosa hugonis trained on a wall trellis at In the Woods, North Chevy Chase, Md. One of the earliest of all the roses and earlier than any other yellow rose.



ROSA HUGONIS, FATHER HUGO SCALLAN'S ROSE.

This is not of so deep a shade of yellow as Harrison's yellow or the Persian yellow rose, but the bush seems to be perfectly hardy and it blooms with an abandon quite foreign to either of the others. Photograph of a bush espaliered against the house, In the Woods, North Chevy Chase. Photo by Crandall.

At the Arnold Arboretum near Boston Professor Sargent says it is perfectly hardy and free flowering and "is certainly one of the most valuable single roses which has lately been introduced into gardens."[†]

It seems entirely fitting that to Dr. W. H. Van Fleet, the originator of the Silver Moon and the Van Fleet roses, those masterpieces of rose hybridization, should be given the credit for insisting, as long ago as 1907, that *Rosa hugonis* be introduced into America for the dooryards of American homes and for the use of American rose hybridizers. It was his insistence that led the Department of Agriculture to import it from Kew Gardens.

In the photograph *Rosa hugonis* is shown as espaliered against the wall of the writer's house at North Chevy Chase, Md. Every spring, before anything but the Japanese flowering apricots (*Prunus mume*) and the single flowering Japanese cherries are in blood, it has delighted all who have seen it, but even in winter it is ornamental because of its red-brown stems, red thorns and its picturesque growth.

When not trained against a wall it grows to a height of about 5 feet and its stems are clothed with numerous slender spines which are bright red on the straight young shoots. Its leaves are thin and delicate and so far as the writer's observations go it is not subject to the rose spot disease which turns briar rose bushes, such as Lord and Lady Penzance, into long unsightly masses of naked stems before the summer is over.

This lovely yellow rose has one small drawback. It does not seem to grow easily from cuttings or slips. It seeds freely, however, and can be raised in this way even should a quicker way not be discovered.

To those who are interested in roses it may be a matter of satisfaction to know that the breeding of this rose with others is now going on here in America, and the appearance of some new descendant of Father Hugo Scallan's rose is probably merely a matter of time.—*Journal of Heredity for September, 1915.*

GREAT IRRIGATION DAM.

The Arrowrock dam near Boise, Idaho, is practically completed and has been in service during the irrigation season of 1915. This dam provides stored water for use in the irrigation of lands adjacent to Boise, Nampa, Caldwell and other towns within the limits of the Boise Project of the United States Reclamation Service.

The Arrowrock dam is the highest in the world, having a height of 348.5 feet from the lowest point in the foundation to the top of the parapet. It is 1100 feet long on top, contains 585,200 cubic yards of concrete and its crest carries a roadway

[†] Arnold Arboretum, Harvard University Bulletin of Information, New Series, Vol. I, No. 5, p. 20.

16 feet wide. The dam has a gravity section and is built on a curve of 660-foot radius. The spillway consists of a run 400 feet long and a concrete-lined discharge trench approximately 900 feet in length with a capacity of 40,000 second feet. In the run and trench lining are 25,400 cubic yards of concrete, all of which is reinforced.

This spillway run carries a movable crest of unique design which permits the storage of water six feet higher than the fixed crest, but drops automatically, very slowly, in case of flood, so as to give the full capacity of the spillway when needed, and rises automatically again when the flood has passed.

A log conveyor with a capacity of 1,000,000 feet per day permits the passage of logs to the mills below. These logs are hoisted to the top of the dam by a cable lift and taken to the river below the dam through a reinforced concrete chute 650 feet long, the upper 400 feet of which carries a bull chain with spurs or teeth set to hold against sliding. This carries the logs down a 62½% slope and delivers them to a gravity chute through which they pass to the river. It is estimated that there is three billion feet of timber in the Boise Basin above the dam that must be handled in this way.

Preliminary to the construction of the dam it was necessary to construct a standard gauge railroad 17 miles long from Barber Junction on the Oregon Spur Line to Arrowrock. This railroad has been in operation four years, and in that time it has carried 80,000 passengers and about 14,000,000 ton miles of freight. It is the only railroad in the country operated by the federal government, and all tickets carry the signature of President Woodrow Wilson in facsimile.

A 3000-horsepower hydro-electric power plant was built to furnish power for the operation of the construction plant. This has furnished all the electric power needed for construction purposes, and in addition considerable of its surplus output has been sold to local companies. Its total output since May, 1915, has been almost 20,000,000 K. W. hours.

A sawmill was operated for almost two years in the timber about 17 miles above Arrowrock, and this furnished 6,750,000 feet, board measure, of lumber, all of which was used for the building of the construction camp at Arrowrock, and to fill miscellaneous requirements on the work.

The excavation for the dam extended 90 feet below the river bed to the granite foundation, and a diversion tunnel 500 feet long with a cross-section 30x25 feet carried the river around the work until the construction was far enough advanced to start the storage of water.

Regulating outlets in the dam are 20 in number, each being four feet and four inches in diameter. They are controlled by a 58-inch balanced needle valve on the upstream face of the dam. They are arranged in two sets of 10 each, the upper set being

150 feet above the river bed. Five sluicing outlets, each controlled by a 5x5 foot sliding gate, are also provided at river level. All these outlets are operated from control chambers inside the dam.

A system of inspection galleries of which the control chambers are a part give access to the dam at several elevations, the lowest of which is 230 feet below normal high water surface in the reservoir. The capacity of the reservoir is 244,300 acre-feet, or about 79,600,000,000 gallons. This reservoir is 18 miles long and extends up two forks of the river. When needed for irrigation the water is carried down 12 miles in the channel of the river to a low diversion dam and from there taken out over the land through a network of canals and laterals. In this way 234,000 acres of sagebrush desert is to be converted into gardens, orchards and farms.

The principal quantities involved in the construction of Arrow-rock dam and the spillway are as follows: Excavation, 683,000 cubic yards; concrete, 610,600 cubic yards; reinforcing steel, 1,350,000 pounds; gates and structural steel, 1800 tons.

All this work was executed under the general direction of F. E. Weymouth, supervising engineer of the U. S. Reclamation Service, with Charles H. Paul, construction engineer in direct charge, and James Munn, superintendent of construction.

A BACTERIAL MANGO DISEASE.

In the *Annals of Applied Biology* II, pp. 1-14, says "W. N." in the *Agricultural News*, appears an account of a detailed research on a disease of mangoes in South Africa by Ethel M. Doidge, M. A., F. L. S., Mycologist, Division of Botany, Pretoria.

The virulence of the disease is such as to threaten seriously to affect the export trade in mangoes. A large percentage of the fruit falls to the ground whilst yet immature, and the mangoes which remain on the trees are rendered unsightly and unfit for the market. The disease was first reported from Barberton in the Transvaal in 1909 and is said to have appeared there after a hail-storm in 1906, the infection starting in a corner of an orchard and spreading rapidly with the prevailing winds. In 1908 not a single fruit was obtained from sixty trees. Each season since the disease has been steadily gaining ground. No record has been found by the author of any similar affection in other parts of the world.

The damage done is mainly to the fruit. Infection also occurs on leaves and branches, producing lesions in which the bacterium is carried over from one crop to the next. On the leaves small angular water-soaked areas, some 2-3 mm. in diameter, appear, which later become dark brown; the surface is somewhat raised and shining and frequently there is a slight exudation of gum.

Longitudinal cracks are produced in infected petioles. On twigs and branches discolored spots occur which are followed by gumming and the development of deep cracks. By the time the fruit is half-grown the whole inflorescence has frequently become affected, and the death of the stalks causes the fruit to drop. On the fruit itself the first sign of the disease is a small water-soaked area; this spreads considerably, and an irregular discolored spot, intersected with cracks, is eventually produced. The discoloration extends for some distance into the flesh.

All the commonly grown varieties are affected, but in differing degrees. The disease has not been found on related indigenous trees.

Extensive spraying experiments with various mixtures have so far given no evidence of the possibility of control by this means, nor have any other remedial measures proved effectual.

The cause of the disease has been shown to be a rod-shaped bacterium to which the name *Bacillus mangiferae* has been given. It is found in great abundance in the parenchymatous tissues of the discolored areas. It does not affect lignified tissues. The optimum temperature for growth of the organism under laboratory conditions is about 30 C. (86 F.). It grows very slowly at 45 C. (113 F.).

Infection appears to be principally carried from tree to tree by wind, and is distributed about the tree in rain-water dripping from infested leaves.

THE POISONOUS NATURE OF CASTOR OIL SEEDS.

The following is a summary from the Journal of the Board of Agriculture (England) of a paper on poisoning by the seeds of the castor oil plant read by Kobert at the meeting of the Union of German Experiment Stations at the end of 1913:

"There is only one species of ricinus plant known to botany, viz., *Ricinus communis*, L., but there are a number of varieties. All the varieties tested have proved poisonous, no matter what the size or color of the seeds. The poison is contained in the shelled seeds and not in the shell, capsule, or oil extracted from the kernel. The substance containing the poison is known as ricin; it is not visible as such in the oil-free kernel; in quantity it forms only 1 per cent of the dry, oil-extracted kernels. As, however, ricin exceeds strychnine or arsenic in intensity, small quantities only of ricinus seeds suffice to make a feeding stuff poisonous, a single gram of the kernel mixed with several litres of milk having proved sufficient to poison a calf.

"Castor oil seeds are introduced into feeding stuffs in various ways. In the first place the hedges of fields of ground nut and sesame in the tropics are often of ricinus plants and the seeds may thus get mixed with those of ground nut or sesame at harvest. During transport, in storage, and in unloading there are

again possibilities of castor oil seeds being mixed with other seeds. A further risk is run at the pressing factory where the machines may be badly cleaned after pressing the castor oil seeds, so that these become mixed with the next kind of seeds pressed. Again, for a soap-making process in Germany the use of castor oil seeds is necessary, and there is the chance of their getting into animal foods owing to the amount of transport of these seeds that has to be carried on. Lastly, large quantities of the shells are sold at low prices to manufacturers of compound feeding-cakes who grind and use these shells in the cakes. As no method is known of completely freeing the shell from the kernel, it follows that these cakes must, as a rule, be poisonous, and on an average Kobert estimates that at least 1 per cent of kernel matter will be present with the shell, an amount which is more than sufficient to cause fatal poisoning of cows when it is remembered that cakes are fed at the rate of from $2\frac{1}{4}$ lbs. up to $8\frac{3}{4}$ lbs. per head per day. Farmers should refuse all such cakes, and merchants who resort to such practice are as guilty as if they included arsenic in their cakes.

"The poison, ricin, is an albumin and has the characteristic (1) of an albumin, (2) of a ferment or enzyme, (3) of a toxin, (4) of an agglutinin.

"From the albumin nature of the poison it results that the mixture of ricin with human or animal foods cannot be detected by purely chemical methods, even when one hundred times the fatal dose is contained in the foods; but the possibility of extracting the poison from foods by water or other method rests on the albumin nature of the poison.

"The enzyme characteristics of the poison are useless for purposes of detection, since feeding cakes are always found to contain enzymes similar in effect to ricin.

"As regards its toxic effects immunity is reached by small and gradually increasing doses; and in the blood serum of immunized animals 'antiricin,' which has the effect of an antitoxin, is formed. This serum has been found extremely effective in the detection of extremely small quantities of ricin, but there is the drawback with this method that a different serum is produced in the case of some varieties.

"The method of detection by injection into guinea pigs and observing whether symptoms of super-sensitiveness are produced is not recommended by Kobert.

"He lays stress, however, on the efficacy of a third method which rests on the agglutinin characteristics of the poison, i. e., even if diluted to one-millionth part of the original strength it coagulates the blood corpuscles of guinea pigs, and a substance like sealing wax is obtained on filtering. This method holds good for all varieties of ricinus and is even more sensitive than the serum test. Even here it must be remembered that 'phasins' give a similar reaction. Ricin, however, will stand a temperature

of 70 deg. to 75 deg. C., while the only phasins that can be subjected to this temperature without being denatured are those present in *Phaseolus communis* and related indigenous legumes, and to detect these from ricin toxicological methods must be employed, e. g., subcutaneous injections with rabbits.

"The paper concludes with elaborate directions as to the conduct of tests for the detection of ricin in feeding stuffs."—*Agricultural News*.

SOME FACTS ABOUT SUDAN GRASS.

The growth of Sudan is a source of satisfaction to the farmers of southern Illinois. It is classed as a forage plant and for its kind ranks high, although comparatively little is known about it.

Sudan grass grows upright in long slender stems, reaching about 5 feet in height. The writer believes that wherever oats will grow Sudan grass will eventually take its place. It will grow on any kind of soil, but prefers a clay sandy soil. It is more difficult to care for than timothy on account of its very rank growth. One of its chief values as a feed for horses and cattle lies in the fact that it is very palatable. When fed to either they clean it up thoroughly, showing that they relish it, although it is an entirely new feed to them. This fact alone is always of interest to farmers and feeders.

On a one-half-acre plot the first cutting made at the rate of one and a half tons to the acre, and in just three weeks the second cutting made practically the same, and there will still be one more crop. Sudan grass is not well adapted for a wet season, such as Illinois has been having this year. On one place it almost drowned out, but this ground was exceptionally wet, and therefore the conditions encountered were not average. In dry years or in average years Sudan grass will produce twice as much as any of the common forages, such as oats, barley, millet and corn (the latter when used as a forage).

Taken as a whole, Sudan grass is destined to be one of the greatest hay and forage crops in this country, mainly because it has almost all the good qualities of the best plus greater production.—*The Breeder's Gazette*.

PUBLIC INCREASES USE OF NATIONAL FORESTS.

WASHINGTON, D. C.—There were 18,342 special-use permits in force on the national forests on June 30 last, according to figures just compiled by the U. S. Forest Service to show the varied uses to which the public is putting the government land involved. The list includes 59 apiaries, 2 brick yards, 31 canneries, 39 cemeteries, 9 churches, 1 cranberry marsh, 32 fish hatcheries, 1 golf links, 43 hotels, 1 astronomical observatory, 10 fox and rabbit ranches, 1085 residences, 74 resorts and club-

houses, 3 sanitariums, 500 sawmills, 163 schools, 9 slaughter-houses, 57 stores, 16 municipal watersheds, and 182 water power sites, with many other uses. Fees collected on 7895 of these permits contributed a total of \$175,840.40 to the general forest revenues, but 10,447 of the permits were issued without charge.

The permits cover more than 1,087,000 acres and 15,041 miles of right-of-way, granted for various purposes, these figures including 173,131 acres for municipal watersheds, 6572 miles for reservoirs, canals, pipe lines, and other irrigation and domestic-supply works.

The steady growth of national forest business is shown in columns of yearly figures going back to the last century. Between 1891, when the first forests were established, and 1900 there were only six timber sales. The number in 1915 was 10,905. The number of free timber permits has risen from 283 in 1901 to 40,040 in 1915, and of grazing permits from 2317 in 1901 to 30,610 in 1915. The special use permits, which were only 298 up to the end of 1905, were increased by 5657 in 1915, making a total during the last 11 years of 42,369. Of these 18,342 are now in force.

POISONOUS BEANS.

A question of the poisonous nature of certain forms of Lima bean, dealt with recently in an article in the West Indian Bulletin, has been responsible for a note on the subject in The Field (London, July 17, 1915). In this it is stated that there is no great difference between the plants of scarlet runner or French beans and the Lima beans. The former are varieties of *Phaseolus vulgaris*, while the Lima beans are cultivated varieties of *P. lunatus*. They differ in the color of the flowers and *P. lunatus* contains fewer seeds than *P. vulgaris*. The seeds of the cultivated races of both species vary much in color. Those of the scarlet runner and French beans are supposed to be poisonous when mature, but as they are never eaten, except when they are quite young and innocuous, this does not matter. Lima beans, however, as pointed out in the West Indian Bulletin, are eaten when mature, and there are cases of fatal poisoning resulting from eating the dark-colored seeds. The subject of the poisonous nature of the Lima bean still continues to present problems requiring further investigation as is shown more and more by references to the subject which appear in the Bulletin of the Imperial Institute.—*Agricultural News*.

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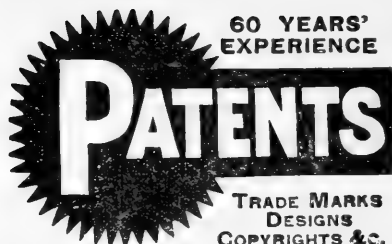
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G. K. LARRISON,
Superintendent of Hydrography.

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Hydrography and Agriculture

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DIVISION OF FORESTRY.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Hauga, Forest Nurseryman, Box 207, Honolulu, Hawaii.

C. S. JUDD,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent of Entomology.

THE HAWAIIAN FORESTER AGRICULTURIST

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No. 12

OUR FRIENDS THE TREES.

Address by C. S. JUDD, Superintendent of Forestry, at Arbor Day Exercises, Pohukaina School, Honolulu, Nov. 19, 1915.

Do you know that the oldest living things in our world are trees? The giant sequoia trees of California, and their brothers, the redwoods, which we use here in these Islands for fence posts and water tanks, are the last survivors of a great family of trees which covered a large part of the western world in the past ages when strange and monstrous animals roamed the forest. When Solomon was building his temple about 2915 years ago, if he had only known it and had had the proper ships, he could have used for the rafters of his temple the giant sequoia of the Sierra Nevada mountains instead of the firs and cedars of Lebanon. Even then, these noble trees, which now tower up into the sky to more than half the height of Punchbowl, were over a thousand years old.

Aside from this interesting fact as to the age of trees, I want to point out why we regard the trees as our friends and why, for that reason, we celebrate this day by planting them.

What did you sleep in last night? A wooden house.

What did most of you sleep on last night? A wooden bed.

What did you eat your breakfast on this morning? A wooden table.

What did you sit in while you ate it? A wooden chair.

What was used in cooking your breakfast? Wood, undoubtedly, in most cases.

What was used in starting the fire in the stove? A wooden match.

What was the newspaper which you read this morning made of? And the books which you study in this school? Mostly of wood pulp.

So you see that we must call the trees our friends if we simply consider their usefulness in supplying us with wood for these articles, without which we could not very well get along.

And besides the value of trees in other countries for producing wood for our use here, let us see how useful are our own trees in these Islands. Take the algaroba or kiawe tree alone, which was first brought to these Islands about 87 years ago and

has multiplied and spread over many thousand acres, so that it is not only a benefit to ourselves, but also to the insects of the air and the beasts of the field. This tree not only supplies us with the wood which we need for cooking and the charcoal which heats our irons when our clothes are pressed, but produces the flowers which furnish pastures for the millions of bees which convert the nectar of the blossoms into honey which we eat on our bread and on our pancakes, and in the dry season when the grass in the pastures is brown and dead it drops the sweet yellow pods which are eagerly devoured by the cattle, horses, and pigs if they can get them before they are picked up by the little children, who take them to the mills, where they are ground up into meal to be fed to the animals later on. And how much more pleasant are parts of our islands on account of the shade which the algaroba trees produce.

When my father was a little boy and rode from Nuuanu to school at Punahou he had to ride around the makai side of Punchbowl and then across the large, open, wind-swept plains which are now crossed by Beretania street and which in those days had scarcely a tree or a house on them. One day his horse ran away with him and he let him run across this vast, treeless stretch of country, part of which is now Thomas Square, and out beyond until he came to a grassy place near a spring. Here he selected a soft spot and slid out from the saddle safely onto the ground.

How different these plains are today! They are not only thickly covered with streets and houses, but the innumerable trees that have been planted there have changed them from bare, wind-swept flats to a comfortable residence district, and when you look down upon them from Punchbowl they look like a huge forest and half of the houses can not be seen on account of the trees.

We plant trees in the city not only for the ornament which their foliage and flowers produce, and which please the eye, but also for the shade which their spreading branches afford and which protect us from the sun. When you wait on the corner for a street car on a hot day, how pleasant it is to seek the shade of a spreading monkey-pod or royal poinciana, and when a sudden shower comes up, isn't it a tree that you run to for shelter?

The value of trees for producing wood for a hundred different uses, for producing fuel, and shade and shelter, we unconsciously accept because they minister to our needs and physical comfort in a direct and tangible manner, but there is another way in which the trees when growing together in a community, which we call a forest, are equally as useful, only we do not realize it because their usefulness is exerted in an indirect manner. It is the effect of the trees in the forest on our water supply to which I refer.

When you drink your glass of clear water you should thank

the forests on the mountains not only for offering you refreshing water, but water whenever you are thirsty and want it. If there were no forests on the mountains back of Honolulu, when the rain fell it would rush down the slopes, into the valleys, and out to sea as a mass of dirty water, and in a few days it would all be done. But with our forests on the mountains it is different. The rain strikes the leaves and tree branches and then falls onto the ferns and bushes and finally onto the ground covered with fallen leaves and moss. All of this retards the run-off of the rain water and the litter on the ground acts as a sponge from which the water oozes out slowly. Water falling on a galvanized iron or shingle roof runs right off into the gutters, but if you covered that roof with moss or gunny sacks you would find that the water would run off much less at a time and would continue for a much longer period. So it is with a mountain-side covered with forest trees. The run-off from the rain is much slower and lasts for a longer time than if there were no forest cover.

Without the forests on our mountains, our water supply would be much less and of poorer quality, and there would be times when there wouldn't be any water at all. Without our forests, there would not be enough water for irrigating the sugar cane fields, and this industry would not be the mainstay of our islands; there would be little or no rice cultivation, and most of our taro patches would be dry. The freshets would dash down from the mountains a great mass of rocks and rubbish, you would seldom have any clear drinking water, and these islands would be a very unpleasant place in which to live.

Because the people of China long ago were careless in cutting down most of their forests, today in that country there are in the rainy season terrible floods which inundate and destroy the lands and kill many of the people.

The influence of forests on streams alone, besides preventing floods and drought, therefore, makes the raising of crops possible, and without crops we could not live.

As man is the most highly organized portion of the animal world, so is the forest the most highly organized portion of the vegetable world. The trees, of which the forest is composed, have functions similar to the workings of the human body. Their roots take water and mineral substances from the soil, which is pumped up to the leaves, which work it over with the aid of the sun and combine it with carbon from the carbonic acid gas in the air, into food which is sent to the living parts in the roots, trunk and crown to assist in the growth of the tree. This food is digested in the leaves of the tree just as food is digested in the human body.

So trees may be considered to be almost human. At least they are our friends, as I have told you already, because of what they do for us and supply us with, and they should therefore be treated by us as kind and useful friends. Don't throw sticks and stones

up into the trees or break off the branches, and when the young trees which you have planted droop in the hot sun, revive them with a pail of water.

Just give the trees a start and they will grow while you are doing other things, and as you get older they will come to be a real benefit and delight and a source of great enjoyment to you.

COMMISSION BUSINESS.

Extracts from Minutes of recent meetings of the Board of Agriculture and Forestry.

SEPTEMBER 3, 1915.

The president presented a special report of the Superintendent of Forestry referring the application of C. M. Hudson for purchase of awa growing in the Hamakua Pali forest reserve, Hawaii. After a lengthy discussion questioning the advisability of establishing a precedent favoring the sale of government awa, and fully considering the relative benefits or disadvantages accruing to the homesteaders and the government, it was moved by Mr. von Holt, seconded by Mr. Rice, and unanimously carried that the matter be referred to the executive officer with full power to act, the board recommending publication for competitive bids and action in accordance with the suggestions in the report, which was accepted and ordered filed.

A special report of the Superintendent of Forestry re application of W. P. Jarrett to clear grass and plant trees on part of Ewa forest reserve at Aiea, next to his homestead, was presented by President Waterhouse. On motion of Mr. Dowsett, seconded by Mr. Rice, and unanimously carried, the recommendation in the report favoring the granting of permission was adopted and the report was ordered filed.

The president presented specifications drawn by the Superintendent of Forestry for constructing a hog proof fence around Olaa Park forest reserve, Section B. Mr. Judd stated that two sides of the reserve were bounded by government roads, one side by the property of Thomas Cook and one side by the property of the Bishop Estate, and exhibited a blue print showing location. After discussion it was moved by Mr. von Holt, seconded by Mr. Dowsett, and unanimously carried that the specifications be adopted and that the executive officer be instructed to approach the Bishop Estate and endeavor to obtain a subscription equivalent to the cost of constructing its share of ordinary fencing.

Mr. Judd stated that he had been devoting a great deal of time to preparing an inventory of property under control of the Board in accordance with new government forms. He asked the members of the Board for an expression of opinion as to the real

estate value of forest lands included in government forest reserves aside from water values. The matter was informally discussed, the sense of the final conclusion being that the real estate value was nominal.

SEPTEMBER 21, 1915.

The president presented the application, and Mr. Judd explained that Mr. Hudson desired to obtain immediately mature awa amounting to two tons from the Puna forest reserve to mix with young awa grown by the homesteaders to enable them to make sales. That Mr. Hudson would agree to pay a reasonable price for the awa and to other conditions to be made by the Board. After discussion it was moved by Mr. Dowsett, seconded by Mr. Rice, and unanimously carried that the executive officer be authorized to make an offer to Mr. Hudson of the sale of two tons of mature awa for a price of \$100, under conditions that the awa be taken within a period of sixty days and that for each mature awa removed 18 slips be planted, together with such other conditions as may seem best to the Board.

OCTOBER 13, 1915.

President Waterhouse announced that the executive officer has issued a commission to Herbert T. Osborn as field entomologist for the board for the collection of beneficial insects. Mr. Osborn had been sent for by Mr. Muir to join him immediately and it had been considered advantageous to commission him to do such work for the board. Upon motion of Commissioner Giffard, seconded by Mr. Rice, the commission was confirmed. Unanimously carried.

President Waterhouse stated that during the past week, while in Hilo, he had looked over the work of Dr. Elliot, the deputy territorial veterinarian for the Hilo district, and found everything very satisfactory; that Dr. Elliot had called his attention to the requirements under the rules of the Board of Health for dairy inspection and stated that it would be an advantage for him to hold a commission from the board as deputy territorial veterinarian for the entire island of Hawaii. After discussion and upon the understanding that there would be no additional expense to the board incurred on account of the increased responsibilities under the commission, it was moved by Mr. Giffard, seconded by Mr. von Holt and unanimously carried that the present commission of Dr. Elliot be cancelled and a new commission covering the entire district of the island of Hawaii be issued in its stead.

Upon request of President Waterhouse, Commissioner von Holt reported for the Committee on Forestry that during the past week he had visited the island of Kahoolawe in company

with the Superintendent of Forestry. He reported conditions greatly improved; that a fine growth of algaroba was spreading; that the number of sheep and goats was greatly reduced and that there were a number of more or less substantially constructed buildings and water cisterns. After a lengthy discussion it was moved by Mr. Dowsett, seconded by Mr. Rice, and unanimously carried that the board get rid of all livestock on the island of Kahoolawe; that the buildings be disposed of to the best advantage and that, with a view to restoring natural conditions, the island be allowed to remain idle for a number of years and that the executive officer formulate a plan to bring these things about.

INSPECTION OF PLANTS.

By E. M. EHRHORN, *Superintendent of Entomology.*

The time is now at hand when many of our plant lovers will be ready to order plants, bulbs and seeds from various locations on the mainland as well as from Europe and other foreign countries. Many people have a dread to send away for plants or seeds for fear that the plant inspector or so-called "*Bugman*" will either kill them by fumigation or destroy them on arrival.

There are no restrictions on the importation of plants, seeds, fruits and vegetables from any part of the *United States*, but all such shipments are subject to the most rigid inspection for pests and diseases on arrival in this Territory. Many shipments arriving here from the various states of the mainland have certificates of inspection attached to the box or package stating that on a certain day Mr. B., inspector of the State of Idaho, inspected the nursery of ——— and found all trees and plants apparently free from pests. Certificates from eastern states generally read "free from San Jose scale" and other insects and diseases of a serious or injurious nature, but these certificates are usually issued when the nursery stock is still growing on the premises of the nursery, so that any root diseases or any root borers cannot be detected.

It has been the policy of the Superintendent of Entomology and Chief Plant Inspector of the Board of Agriculture and Forestry to disregard all certificates and only to pass all shipments of plants, bulbs, seeds, fruits and vegetables after his own inspection at the port of entry. In this way all pests which are located on the plants, etc., can be detected before the shipment is released.

All clean plants, that is, all plants free from any pests or diseases—and this applies to parts of plants as well as to other horticultural products including fruits—are passed immediately upon arrival.

All infested plants, those showing fungus diseases or insect pests, are either treated by fumigation, or are destroyed, all de-

pending on the infestation. If these plants are infested with pests already present in the Territory they are released after a thorough fumigation. This is done to prevent their being brought into some new locality where the pests might not exist. If the plants are infested with pests not known to exist in the Territory, they are destroyed and the party to whom they were consigned receives a certificate of inspection stating that the plants have been destroyed on account of being infested with a certain pest not known to exist in the Territory. This certificate can be used as a counterclaim against the nurseryman who sent in the infested plants. The same methods are used for shipments of fruits and vegetables.

Soil attached to the roots of plants is prohibited. Soil usually is a carrier of disease spores and eggs, larvae, pupae and adult insects. In ordering plants it is very important to inform the nurseryman or the florist of the soil regulation and see to it that he removes as much soil as possible from the roots and places moss around them before packing for shipment. Insist on the nurseryman sending good, clean stock and if a large order is given be sure to instruct the shipper to place plants in a large, well-ventilated box. This is absolutely necessary on account of the long voyage, which, if at all stormy, will prevent any plant shipment from receiving sufficient ventilation and the shipment will heat in transit and upon arrival many valuable specimens will be ruined. Many people send mail orders to the eastern states for plants, especially for roses, usually for small quantities, and they invariably arrive dried out and the flimsy box crushed in. The eastern shipper does not realize how far Honolulu is from where he has his nursery and he does not provide enough packing material to keep the plant moist for from 14 to 16 days. Nor does he use a strong enough shipping box for such a long journey where several transfers must be made before the final destination is reached. Anyone ordering from such places should insist upon the shipper using better than his usual methods so as to warrant the safe arrival of his goods.

Those who contemplate importing plants from countries outside of the United States have greater difficulties in so doing. Since the inauguration of the Federal Plant Quarantine Act by Congress, many rules and regulations pertaining to the shipment of plants from foreign countries into the United States have been made.

All plants, parts of plants, bulbs and seeds, excepting flower, vegetable and field seeds, cannot be sent into the United States or its territories by mail from any foreign country. This also includes packages by parcel post, and most plants from foreign countries would be sent by parcel post. All such shipments are immediately returned to the shipper and the consignee is notified of this action by the postmaster. The reason for the regulation is very apparent to those who come in daily contact with inspec-

tion work. It is next to impossible to prevent every package of plants or seeds from being passed by a postoffice without first having been inspected by the proper authority, as many packages are either not marked at all, or they are marked "*merchandise*" and in the great rush in the distribution of mail matter a number of packages will be overlooked. On account of this uncertainty some serious pest would be liable to be introduced into the country. Therefore, by prohibiting all plants and seeds by mail all this danger is avoided.

On August 20, 1912, Congress passed what is known as the Plant Quarantine Act. Under this act all importers of nursery stock and other plants and plant products are required to obtain a permit from the Federal Horticultural Board, U. S. Department of Agriculture, Washington, D. C., for importing all such plants from foreign countries. Application blanks can be had from the Superintendent of Entomology, Board of Agriculture and Forestry, Honolulu. By nursery stock is meant all field grown florist stock, trees, shrubs, vines, cuttings, grafts, scions, buds, fruit pits and other seeds of fruit and ornamental trees, except field, vegetable and flower seeds, herbaceous plants, bulbs and roots. After receiving a permit to import the desired plants the importer must order his plants from a country which maintains a government plant inspector who shall furnish a certificate of inspection in duplicate, one to be attached to the bill of lading, the other to the shipping case. Each package or case must be marked with the name of the grower of the plants, the shipper, the name of the consignee and the locality where grown, and must also have a list of the plants contained in the package attached to the outside of the same. From countries which do not maintain a government inspector only certain plants to be used for experimental purposes can be imported under a *special permit* granted for that purpose.

The following horticultural products are prohibited from entry into the United States or its territories: All five-leaved pine trees, on account of the white pine blister rust, from Europe and Asia; all citrus fruits, mangoes, sapotes, peaches, guavas and plums from Mexico on account of the Mexican fruitfly, and date palms from certain counties in California, Arizona and Texas on account of two serious scale insects. Cottonseed of all species and varieties and cottonseed hulls from any foreign locality and country excepting the Imperial Valley in the State of Lower California, Mexico, on account of the cotton boll weevil. Alligator pear seeds are prohibited from importation into the United States from Mexico and Central America on account of the avocado weevil. Sugar cane is prohibited from importation into the United States, excepting Hawaii and Porto Rico, on account of serious insect pests and fungus diseases existing in foreign countries. However, although allowing sugar cane to be imported into Hawaii and Porto Rico, these countries are prohibited from send-

ing sugar cane to the mainland of the United States, regardless of the use for which it may be intended.

All citrus nursery stocks, including trees, buds, scions and seeds from Europe, Asia, Africa, South America, North America, outside of the United States, and foreign Oceanic countries and islands, are prohibited from importation into the United States on account of a serious disease known as the citrus canker.

The following horticultural products cannot be exported from the Hawaiian Islands to the mainland of the United States: All fruits excepting pineapples and bananas, and these only when a permit of inspection is attached to the package or bunch. This is on account of the Mediterranean fruit fly. All cotton bolls, seeds and cotton seed hulls are prohibited on account of the pink cotton boll worm.

The following vegetables are also prohibited from being shipped: Chilipeppers, eggplant, squash, watermelons, tomatoes, cucumbers, pumpkins and stringbeans, on account of the melonfly.

By observing the above regulations and by insisting on getting the very best plants and seeds on the market, there should not be any trouble in importing these into the Hawaiian Islands.

DIVISION OF ANIMAL INDUSTRY.

Honolulu, Oct. 23, 1915.

Board of Commissioners of Agriculture and Forestry.

GENTLEMEN:—I respectfully submit as follows my report for the Division of Animal Industry for the month of September, 1915:

Under date of July 15, 1915, I was authorized by the Board of Agriculture and Forestry to attend the annual meeting of the American Veterinary Medical Association, which this year was to be held at Oakland, California. During the 52 years of its existence this is but the second time that the said association has met west of the Rocky Mountains, and as it undoubtedly will be quite some time before it occurs again, the opportunity for meeting the leading members of the veterinary profession of the United States and Canada, without making an extensive and expensive voyage to the central or eastern part of the mainland was recognized by the Board, appropriating the sum of \$250.00 for traveling expenses. An account of my expenditure under this appropriation, approved by the auditor of the Territory, is herewith appended, and in submitting my report on observations and impressions received on my trip, I take the opportunity herewith to thank the members of the board for granting the same and to assure them that I have returned with new ideas, refreshed in body and mind and anxious to turn the same to account for the live stock industry of the Territory.

GLANDERS.

During my absence from the Territory the work of the Division has devolved upon the assistant territorial veterinarian, who informs me that everything has gone smoothly, and as his report, herewith appended, will cover the work in detail there only remains to mention the fact that glanders has once more made its appearance in Honolulu. No apprehension need, however, be felt on that account as the outbreak was an isolated one, and was quickly brought under control by the destruction of the only two animals on or near the infected premises. But the case is of interest in that it adds to our knowledge regarding the length of time the infection of glanders may remain undetected in the system of apparently healthy animals, it being fully 5 years (1910) since the last case of glanders occurred in the stable in question, since which time the disease has been considered practically eradicated here. That such out-croppings of infection from old encapsulated and incrustated centers, in the lungs especially, in animals which were exposed to the infection years ago, but which at the time failed to react to the mallein test, might occur, was predicted in my annual report for 1913-1914, on page 183, and that this outbreak is one of this nature, and not due to extraneous infection, was fully proven by the post-mortem examination, which showed the presence of old calcareous nodules in the lungs of one of the two affected animals. I do, however, not wish to encroach on Dr. Case's report on this very interesting outbreak beyond reiterating that so long as horse owners will adhere to what they learned during the many years when glanders was an every-day occurrence here and will report immediately the appearance of any suspicious symptoms, especially the characteristic discharge from the nose and the enlarged glands under the jaw, there is little danger of the disease again getting a foothold here; but with old age comes the danger of recrudescence of these hidden centers of infection, and while we may still consider *the disease* as practically eradicated, *the infection* cannot be said to be completely or absolutely extinct until the last animal, at some time exposed to the invasion of virulent glanders bacilli, is dead.

The early report of suspicious cases must, therefore, be insisted on, and drivers, stable men and horse owners are herewith reminded that the territorial statutes as well as the regulations of this Board pertaining to the suppression and eradication of glanders and prohibiting the sale, exchange or exposure on public roads of infected or exposed animals are still in force and must be adhered to.

THE AMERICAN VETERINARY MEDICAL ASSOCIATION'S MEETING AT
OAKLAND, CALIFORNIA.*Foot and Mouth Disease and Hog Cholera.*

The live stock industry of the United States received last year one of the most severe blows in its existence.

The dreaded disease apthous fever, commonly called foot and mouth disease, made its appearance, practically in the center of the United States. To this day nothing definite is known as to how the infection was introduced. By surmise and deductions the live stock sanitarians have reached the conclusion that the disease was brought in with tanning materials from Japan. Two previous outbreaks, in 1902 and 1906, respectively, were traced to smallpox vaccine imported from abroad. In both of these cases, however, the disease was quickly recognized and its spread limited to a comparatively small number of states. Last year, however, nearly two months elapsed before the final diagnosis was made and the machinery of eradication set in motion. By that time the disease was scattered from the Atlantic to the Rocky Mountains and from Minnesota and Michigan to Arkansas and Texas—the Chicago Stock Yards even serving as a center of distribution. The situation was extremely serious and called for heroic measures such as had never before been dreamed of—leave alone the expenditure of millions of dollars. In less than a year, however, the disease was under complete control, only a few scattered localities remaining in quarantine, an achievement which did much to rehabilitate the standing of the veterinary profession and especially of the Federal Bureau of Animal Industry, which had to bear the brunt of “chimerical and vituperative opinions of the general and agricultural press” for failing to recognize the disease in time. But “although the sacrifices had been great and the cost enormous, (says the National Stockman and Farmer of Pittsburg, Pa.,) they were as a molehill to a mountain in comparison with the sacrifices and cost of policing and other measures which would have become necessary had the disease been allowed to become permanently established among our flocks and herds, imposing endless quarantines, condemnations and losses to stockmen, slaughterers and all concerned in the live stock industry.”

But the end was not yet. The veterinary meeting in Oakland was expected to be the greatest gathering of its kind ever brought together, some 900 or 1,000 members being expected. Instead of that about 150 put in an appearance and the greater majority of these came from the Pacific Coast States. The cause for this was a new outbreak of the same disease, not less than five states, New York, Michigan, Indiana, Illinois and Minnesota, reporting outbreaks of foot and mouth disease in widely scattered localities. This news came like a thunderbolt from a

clear sky. The live stock industry was just emerging from the worst crisis of its existence, and hopes of exhibiting at the large annual State fairs, which every fall gather the leading producers and representatives of every known breed of live stock in friendly competition, seemed almost sure of realization when the blow came.

By some as yet unexplained blunder hog cholera serum made from hogs harboring the foot and mouth infection reached the market and found its way to many localities which had hitherto escaped the disease or where it had already been eradicated and quarantine discontinued. The same severe restrictions on the movements of all cloven-hoofed animals, with shot gun quarantine of the infected farms, districts or counties, immediately came into force again, while the hopes of the exhibitors went aglimmering.

The early recognition of the cause of this second outbreak, and the fact that practically every bottle of the infected serum could be traced from the factory to its recipient, served however to greatly restrict the spread of the disease and assist the sanitary authorities in their efforts at suppression.

It may, therefore, be reasonably presumed that the secondary outbreak will soon be under complete control even though it will be too late for the Panama-Pacific Exposition's great live stock exhibit. This does not mean that no live stock will be shown there, but only that numbers of the leading breeders in the infected states will be barred from sending their show herds while many others, even from localities hundreds of miles from infected territory, will refrain from taking any chances of infection in transit or risk quarantine and destruction in case the disease should find its way through obscure and unknown channels to hitherto uninfected districts, as it has proven itself able to do.

The lesson to be learned from this last outbreak, though a costly one, may, however, prove an immensely valuable one. This is, as stated, not the first time that foot and mouth disease has been carried to this country, or scattered through it by means of biological products, though it is the first time this carrier was of local manufacture.

The inside facts of this story have, at the time of this writing, not been made public, beyond what has already been said, and while the Federal Bureau of Animal Industry is receiving the entire blame for the occurrence, it will undoubtedly be found in the end that cupidity coupled with ignorance and carelessness on the part of the so-called manufacturing chemists and their employees in using diseased stockyard hogs, presumably suffering from hog cholera, in the manufacture of serum, is at the bottom of it. Such animals reach the great live stock centers in large numbers, many farmers near a convenient market preferring to ship all their hogs at the first appearance of cholera among them,

and taking chances on a majority of them getting there alive and passing both ante- and post-mortem inspection, rather than going to the expense and trouble of sending for serum, or serum and virus, and thus get their farms or premises thoroughly infected and requiring the permanent use of serum. According to the virulence of the infection more or less of the hogs reach the market in a diseased condition and those which are condemned on ante-mortem inspection have (*or had*) little or no value, except for tankage. But with serum plants conveniently located such animals become of value for the manufacture of virus, being already infected and ready for "tapping." At the same time a sick animal is more susceptible to any kind of infection than a healthy one, while the symptoms of one disease may easily obscure or vitiate the symptoms of another. In this way some cholera infected hogs may have picked up a few attenuated but still surviving foot-and-mouth disease organisms, and, under cover of the cholera symptoms, have nursed them back to their original virulence. But before the characteristic symptoms of the secondary infection—the blisters and ulcers in the mouth and between the hoofs, the slavering and lameness—make their appearance, the hog is disposed of to a serum manufacturer, and the last drop of his blood is drawn and bottled, ready for distribution among unsuspecting hog raisers for the treatment and prevention of disease.

If the above surmise should prove correct it is obvious that the blame cannot be placed on the federal inspectors, whose duty consists in an annual or semi-annual inspection of the serum plants to see if the federal requirements as to sanitation and equipment are up to the standard. The actual and daily control of such establishments rest with the local health authorities, on whose officers devolves the inspection of all animals used in serum and virus production and the passing upon of the finished products before distribution.

But considering the immense increase in the manufacture and use of biological or serum-therapeutic products which has taken place during the past few years, and keeping in mind that these products deteriorate rapidly and therefore must be manufactured in the neighborhood where they are to be used, it will be seen that the federal authorities can only supervise such manufacture in the most cursory manner and must of necessity leave all details to the local authorities. Development along these lines has, however, been so rapid that it is a wonder that no greater calamity has not already occurred, especially when considering that we are dealing with poison of a most insidious nature, such as bottled hog cholera virus. Little wonder, therefore, that Dr. J. R. Mohler, assistant chief of the U. S. Bureau of Animal Industry, in reply to a direct question as to the advisability of the use of the hog cholera virus in this Territory, should express himself as absolutely opposed to it, unless the Territory was over-

run with the disease. Furthermore, he said, the shipment of infectious and contagious diseases in interstate trade is what this bureau was established to prevent and not to encourage or connive at, and it will undoubtedly not be long before the serum-simultaneous treatment will be completely abandoned or prohibited and the serum alone treatment established in its place.

The same view was expressed by every other live stock sanitarian of prominence to whom the local situation was explained—the fact that this Territory can be absolutely guarded against the introduction of infection from abroad being the most obvious reason for not introducing it in bottles, but to fight it with serum, sanitation and segregation. In fact, the past year has seen a strong turn of the tide among the veterinarians, practitioners as well as officials, against serum alone and sanitation. Whether the hog louse has any actual part in the transmission of cholera from animal to animal has not as yet been established, but the fact remains that thorough sanitation, with disinfecting hog wallows and periodical dipping, seems in a number of cases to have kept certain hog farms free from the disease even though all the surrounding farms were infected. In the Breeder's Gazette of September 16, 1915, Dr. Nelson, State Veterinarian of Indiana, says: The more I see of vaccination and its results in a general way the more I feel convinced that sanitation and not simultaneous vaccination is the solution of the hog cholera problem." And in another part of the same article he says: "I rode 91 miles one day last summer and that day did not visit any but sick herds, all of them having been vaccinated by the simultaneous method, being healthy when vaccinated, the loss ranging all the way from 12 to 94 per cent." Preceding this statement Dr. J. W. Connaway, chief of the Veterinary Department of the University of Missouri, gives the following advice: "I would, therefore, say to the young breeders and exhibitors, do not permit anyone to use that little virus syringe on your show hogs nor in your home herd. Do not permit anyone to bring onto your clean farm a little bottle labeled "Virus—Danger" for that little bottle *docs* contain elements of danger which you do not want scattered over your farms. The inoculation of the contents of that bottle into your hogs is liable to make some of them sick, and some of them are liable to die, and the urine and dung from the sick hogs contain cholera germs which it is not well to have scattered over the premises. The scattering of this infection is planting seeds of disease for future trouble." And in conclusion Dr. Connaway adds: "The time is coming when there will be such a strong lineup of the agricultural press against the commercial use of hog cholera virus that its interstate traffic will be prohibited. It has been charged with carrying foot-and-mouth disease from one state to another. It has done worse than this, it has been carrying a disease that has cost the farmers of America vastly more than the foot-and-mouth disease."

So much for the indiscriminate use of hog cholera virus. At the Oakland meeting of the American Veterinary Medical Association a symposium of articles on hog cholera in all of its aspects concluded with a set of resolutions which were not even read by title, it being close to midnight, but which I had an opportunity to glance over. These resolutions admitted of the use of the virus treatment in heavily infected territory, and then in the hands only of veterinary officials or experienced sanitarians. Had these resolutions come up for discussion it is doubtful if even *that* much would have been conceded, there being present a number of state veterinarians absolutely opposed to the use of virus, whether in the hands of experts or otherwise. Dr. Connaway of Missouri, for instance, in the above quoted article says: "There is no veterinarian, no matter how expert he may be, who is always able to gauge the dosage of the serum and virus so as to prevent occasional disastrous results, if he honestly tries to give the breeder what he is paying for, namely, a life immunity to his show hogs."

It must therefore be admitted that there is a certain amount of risk connected with the use of the virus even under the most favorable conditions and that this risk at times becomes prohibitive. We also know that vaccination cholera occurs only when the relation between the injected virus and the preventive serum is not properly balanced, that the virus is too strong or the serum too weak, or that the virus contains micro-organisms and toxins against which the serum is ineffective or lacks the required antitoxins.

The point would therefore be, in districts where cholera prevails and where there might be some excuse for the application of the serum simultaneous vaccination to use virus only of the strength or virulence of the infection already on the premises, and avoid bringing in a stronger infection, as is frequently done with commercial virus. This idea was suggested to me by Professor Haring of the Veterinary Department of the University of California, who has seen it used successively on several large pig farms near Berkeley. On these farms where swill is being fed exclusively and where the swill is not boiled, there is always danger of cholera being introduced with pork scraps which in smoked or cured, but uncooked forms, is said to be able to transmit the disease. So when cholera breaks out a carefully selected pig showing typical symptoms of the disease is bled to death, the blood being gathered in sterilized vessels and defibrinated by shaking and straining. A post-mortem examination of the carcass is then made and if typical hog cholera symptoms are found the collected blood is used as virus in the serum-simultaneous treatment of all the susceptible hogs on the place. By this means no new infection is brought in, but the animals are protected against the infection already on the place, the use of the virus simply

insuring that all of the animals become infected and thus develop an active immunity under the protection of the serum.

The owner of a large pig ranch close to the Berkeley serum plant, who purchases all his serum there, absolutely refuses to use their virus, but prefers to develop his own virus as described. A week or ten days after birth all pigs are given a dose of protective serum alone; then at weaning time, when large numbers of pigs are to be actively immunized the owner brings to his place a sufficient number of young hogs, 100-125 lbs. apiece, from some part of the State where hog cholera is known not to exist, and which consequently are highly susceptible to the disease. These pigs are tested for tuberculosis and are then turned out on the premises, their temperatures being taken every day so as to know when they become infected and when is the best time to kill them to obtain the most effective virus. With this and the serum purchased from the Berkeley plant, all the weanlings are then treated, and, it is said, with highly satisfactory results. It should be mentioned that the owner in question raises ten to fifteen thousand pigs annually and feeds swill exclusively. But as he does not boil his swill there is a constant danger of reinfection, necessitating the continued use of serum. It was suggested that the disease could easily be stamped out and reinfection by means of the swill prevented through boiling, but it was held that the cost of boiling would equal the cost of treatment, and that there were so many other sources of infection from the cholera infected neighborhood, and which it would be almost impossible to guard against, the present method had been found the most economic. This undoubtedly is true, and will continue so until the disease has been brought under better control, but it is equally certain that the continued use of virus will postpone eradication almost indefinitely or until a breed of swine with natural inherited immunity has been evolved.

In the meantime I can see no serious objections to the Berkeley method being tried here by pig raisers who believe they have the infection on their premises, if proper precautions are taken, and conscientiously adhered to against the spread of the disease. Immune pigs are easily obtained here, and if such pigs develop cholera when exposed on the suspected premises their blood should furnish an ideal virus for just that place. But to introduce virus here from abroad I am even more strongly opposed to than before my visit to California. There is absolutely no call for it with the small amount of mild infection which may possibly still be here, as there will always be grave danger of serious losses from inoculation cholera and its subsequent escape to hitherto uninfected districts.

If the above suggestion is acted on by any of the local hog raisers, the following precautions, as laid down by federal and state authorities, should be adhered to and only on premises where thorough sanitation can be maintained and where the

escape of the infection can be effectively guarded against, should be allowed the practise of any method which carries with it the dissemination of pathogenic (disease producing) organisms.

CONTROLLING CARRIERS OF CHOLERA INFECTION.

By J. W. CONNAWAY, *University of Missouri*.

Breeder's Gazette, Sept. 30, 1915, pp. 548-550.

The most dangerous distributors of hog cholera infection with which the farmers have to deal are the sick and the exposed hogs. And if the farmers will devote greater attention to the control of these primary carriers and distributors of cholera infection, and will carry out the measures of control recommended herein, relating to dead hogs and infected feedlots, there will be but little danger from the distribution of cholera by the several secondary carriers that will be mentioned; for there will be but little infection to carry.

It is far more important to watch the hogs than the buzzards. The driving of sick hogs upon the highways to market is prohibited by law, but the law is sometimes broken by those who are ignorant of the provisions, and sometimes by those who know the requirements of the law, but ignore them, and have no regard for the rights of their neighbors. Sick hogs should never be removed from the farm, but should be closely quarantined until they have recovered or died. The infection and infected carcasses should be destroyed. The shipment of sick hogs to the market, even when hauled to the shipping station, spreads the disease, and increases the dangers at the local and large central stockyards, as well as being a source of danger to the farms lying along the railroad lines.

Healthy hogs that have been exposed to sick hogs in the same feeding pens may communicate the disease from contamination of their feet and bodies, and should not be driven over the roadways to market. They should always be hauled to the shipping station. If driven to market the farms along the highway are endangered. Streams, crossing the highway and passing through one or more farms, may become sufficiently contaminated from the feet and bodies of the hogs to start an outbreak. Only healthy hogs, from clean farms, should be driven to market, and it is probably a good practice to haul these, on account of the shrinking in weight from driving.

It is possible for cattle that have been fed in feedlots where hogs have been dying of cholera to carry the infection on their feet, when driven to market, and to spread the virus along the highway, whence it may find its way to adjacent farms. The feet of cattle may be easily disinfected by driving the animals through the dehorning chute, in the floor of which every farmer

should have a shallow vat, preferably of concrete. The vat should be the full width of the chute and 8 or 10 inches deep. (This vat is serviceable in the treatment of sore feet, in all farm animals, particularly cattle and sheep). A strong solution of copper sulphate (bluestone) or a 4 per cent. solution of the cresol compound solution should be used to clean and disinfect the feet of cattle that have been on cholera-infected grounds.

The danger of a recently purchased lot of feeding cattle carrying hog cholera germs on their feet, from an infected stockyards to the farm, should not be overlooked; and the proper disinfecting of the cattle's feet should be made to prevent the infection of the pastures and feedyards.

It is well known that dogs serve as carriers of cholera infection. It is therefore advisable, during outbreaks of cholera in the neighborhood, to keep all valuable dogs in quarantine, especially at night, to prevent them from roving about and visiting cholera-infected farms, where carcasses may have been left unburned. Worthless stray dogs should be destroyed.

Hog cholera infection is easily carried by chickens and turkeys from the roadway along which diseased hogs have been driven, or from an infected pen to clean pens, on other parts of the same farm. These fowls should be shut away from the hoglots, during outbreaks of hog cholera on the farm, or in the neighborhood. A few dollars spent in poultry netting will be less expensive than buying serum and cholera medicines, and will often save hundreds of thousands of dollars to the neighborhood. Pigeons are more dangerous as infection carriers,* because of their habits of flying to neighboring farms and feeding with hogs that may be suffering from hog cholera. The pigeons should be destroyed or kept in confinement when cholera is in the neighborhood. Buzzards and crows should be dealt with by shotgun quarantine. Simultaneous and repeated attacks upon the roosting camps of these undesirable birds by farmers' clubs or anti-hog-cholera clubs will soon rid a neighborhood or county of these infection carriers. When the practice of burning all animal carcasses has become well established in a neighborhood, the buzzards will migrate to other regions where carrion food is available. They do not visit clean farms.

The traveling hog-doctor, with his "sure cure" and "preventive" for hog cholera, and all other ills to which swine are subject, should not be a welcome visitor, for he is liable to be an infection carrier. His business takes him to diseased herds; as a rule these business parasites are not careful thoroughly to disinfect their contaminated shoes and overalls after treating (?) a diseased herd. The itinerant "vaccinators" and local "farmer-agents" for serum companies are also undesirable visitors. They are more interested in their "commissions" and "fees" than in sanitation, and are more likely to spread cholera virus "with both hands and both feet" than they are to give relief from a threat-

ened danger from other sources. The local stockbuyer is a valuable gobetween for the farmer in marketing small lots of hogs, but he becomes a nuisance and menace if he forms the habit of seeking for bargains in diseased and badly exposed herds. He thus aids in maintaining infected pens at the local stockyards, and carries infection on his shoes to healthy herds and clean farms.

The owners of healthy herds should keep stock-buyers out of their hog-lots, if they have come from infected premises, and have not properly disinfected their shoes. Stockbuyers should join the farmers' anti-hog-cholera clubs, and do everything they can to aid in eradicating cholera by applying proper sanitary measures. It will serve their own business interests in the best possible manner.

Cholera infection may be carried to healthy herds and farms by teams and wagons. Threshing outfits that go from farm to farm should be careful to not drive through cholera-infected hog-lots, or in fact through healthy hoglots. Inquiry should be made as to the presence of cholera on the farms where threshing is done. Every precaution should be taken by every man on the force to avoid coming in contact with the infection, and to prevent the teams and wagons from doing so. When hogs are hauled to the local stockyards it is a wise precaution for the farmer not only to disinfect his shoes but also to disinfect the feet of the team, and the wheels of the wagon, before returning to the farm, especially if sick hogs have recently been unloaded in the local stockyards. Also disinfect the inside of the wagon-box, and the litter it may contain.

HOG RAISING IN HONOLULU AND VICINITY.

Immediately upon my return from San Francisco, an effort was made to ascertain the present status of the hog industry in and around Honolulu. If cholera was present an opportunity to test the Haring method on a small scale might be found, and if not it was desired to learn exactly to what extent hog raising had recuperated since the epidemic of 1911 when the Moiliili district was almost cleared of hogs. Dr. Case was therefore requested to make inquiries regarding hog raising at all farms and dairies where the tuberculin testing took him and special trips were made to those districts where hogs are always raised on a small scale. On Mr. Charles Bellina's farm at Kuliouou, one of the two places where cholera was prevalent last spring, everything was found highly satisfactory. There boiled swill is fed with alfalfa and no disease of a suspicious nature has appeared for several months. Good litters averaging from $5\frac{1}{2}$ to 6 is the order, the pigs being treated to a small dose of serum a week or ten days after birth and to a full dose at the time of weaning. As no virus has been used it is obvious that the infection, unless carried by some of the survivors from the last outbreak, must by

this time have died a natural death or else become greatly attenuated. Mr. Bellina expressed himself as satisfied with the general outlook and it is indeed difficult to see how conditions could be improved on from a hygienic viewpoint. If extraneous infection is carefully guarded against and the swill heated to the boiling point there only remains the introduction of the more recent sanitary improvements, such as oil rubbing posts or disinfecting wallows or dipping tanks to make conditions ideal. Besides this Mr. Bellina has succeeded in improving the quality of his herd greatly by the use of good boars, and by judicious selection of sows for breeding it should not be long before uniformity in individual excellence is attained.

For downright enthusiasm, however, on the subject of hog raising one must visit the farm of Mr. Charles Martin, on the mauka side of Diamond Head. Mr. Martin all but sleeps with his hogs, and his success is so much more remarkable as he began a few years ago with practically nothing, a small stony lot and a few razor back sows—and cholera. He therefore had a hard row to hoe, and it was not until hog cholera serum became available that he began to forge ahead. Mr. Martin feeds swill exclusively, and he does *not* boil it, but he watches each sow and her litter and personally treats them with serum in the same way as mentioned above. In fact this method of injecting serum in the young pigs a week or ten days after birth, and again at weaning time, was originally introduced here by Mr. Martin, and to this he ascribes his astonishing success as a hog raiser. At the same time he has always been a strong believer in disinfectants, lime especially and some kind of coaltar creosote, besides establishing an effective shotgun quarantine against trespassing dogs, chickens and sanitary inspectors. But in the writer's opinion all of these measures have been but secondary auxiliaries to Mr. Martin's untiring energy and unfailing attendance upon his herd and its requirements at all times. A casual observer would not proclaim the farm a show place nor the herd a show herd, but Mr. Martin knows and appreciates a good mother sow and consequently he loses very few pigs. He gathers what green feed he can find, such as pig weed and honohono, and feeds cracked corn or middlings only in finishing his hogs for the butcher.

In the Moiliili district a great change has taken place since the epidemic of four years ago. About 25 piggeries with an aggregate of approximately 1200 hogs were visited. Scrupulous cleanliness and strong litters of young pigs were in evidence nearly everywhere. All swill is sorted and boiled with chopped green feed, pig weed, honohono and some panicum to which is added a varying amount of rice bran. No disease of any kind has occurred since the places were restocked from one to two years ago, and no serum is used. The animals, young and old, look well in spite of the frequently rather confining quarters. When asked for an opinion in regard to the use of serum and to what

the present promising conditions might be ascribed, one Oriental said: "Before too much pilau, this time wash wash, all time wash. Medicine too much money. Maybe by and by." An effort was made to impress these thrifty hog raisers with the necessity of reporting without delay any outbreak of disease, that we would be glad to help them and that we could help them now. Also they were reminded of what happened before when they succeeded in keeping the outbreak secret and every last hog in the district died. The difference between glanders and hog cholera was explained—a considerable number of horses and mules having been destroyed in the Moiliili district some years ago—and the fact that a hog with cholera could be treated and often saved, whereas a horse with glanders was incurable and had to be destroyed, was emphasized.

In the Kapahulu district things do not look quite so promising. There is in several cases a lack of care and attention, hogs, dogs and poultry all run together and as a rule only the boar is kept confined. As a consequence a number of pigs die. Serum is used in some places, more or less regularly, and in others not at all. This district illustrates better than any other the benefits of care and sanitation. Where these factors are in evidence the pigs are doing well, serum or no serum, but where they are lacking or entirely absent the litters are small and unthrifty and a number die. This does not mean that the serum is of no value, but emphasizes the value of hygiene and sanitation.

In regard to Mr. Pond's place, Dr. Case informs me that conditions are greatly improved and that no losses of any consequence have occurred recently. As intense swill feeding is practiced successfully both here and on the Mainland, and as Mr. Pond has had an opportunity to familiarize himself with the manner in which it is done on some of the largest hog establishments in California and other places, no doubt in the near future he will be able to demonstrate just how the most benefit can be obtained from this valuable but cheap hog feed. I should have liked very much to look into the subject myself but in the first place it is a question of animal husbandry to be dealt with by federal or territorial experiment stations, and in the second place travelling is very expensive in California and I was without funds for the purpose.

SORE HEAD, ROUP OR CHICKEN POX.

This disease familiar to every poultry raiser in the Territory, has for years been held responsible for the lack of interest taken in the egg and poultry business here. While it must be admitted that the disease, once it gains entrance into the yards and runs of a successful chicken farmer, is likely to cause him some loss and a great deal of inconvenience, if he makes an earnest effort at curing the affected birds and prevent the healthy ones from

taking it, still it is curable in 90 per cent. of cases. The treatment, however, is tedious as each bird must be caught and handled a number of times, and the disease frequently gets out of hand and in spite of every effort appears again and again among the segregated healthy birds.

It is therefore a pleasure to announce that a new* cure and preventive has been found which not alone reduces the number of times the affected birds must be handled to a minimum, but the application of which to the healthy birds acts as a vaccine which immunizes them for at least a year and perhaps for life. The method is simple but requires some care in the preparation of the vaccine. The latter is made by scraping the crusts off the tumors and cores which appear on the comb, wattles and skin of the head. These crusts are carefully weighed, then ground in a mortar with a sterile salt solution, strained through cheese cloth, and the resulting fluid is then heated for an hour over a water bath, at a temperature of 55° C. and the vaccine is ready for use. With a hypodermic syringe, a dose of 2 cc. is injected under the skin of the abdomen near the thigh where the skin is free of feathers. This treatment has no detrimental effect upon the healthy birds, but actually prevents them from becoming affected even when left among the sick ones. The latter should be treated as usual at the same time they are injected, that is by painting the tumors and sores from which the crusts have first been removed with tincture of iodine. The number of affected birds cured is at least twice as large as without vaccination.

In order to introduce this treatment here it is desired that owners of birds suffering from sore head, roup or chicken pox at once communicate with this office and at the same time forward scrapings from which to prepare the vaccine. Only crusts taken from the comb, wattles and head should be used, not the exudate from the nostrils nor the diphtheritic membranes from the mouth. The quantity required is about a teaspoonful but less can be used (minimum 15 grains). Place the crusts in a wide-mouth bottle, seal and forward in a mailing case by special delivery to the undersigned. If possible the vaccine will be sent by return mail. When removing the crusts wipe off the blood with absorbent cotton and paint the sores with tincture of iodine.

Respectfully submitted,

VICTOR A. NORGAARD,
Territorial Veterinarian.

The original work on controlling chicken pox or sore head in chickens by vaccination was done by Dr. J. R. Beach, of the U. S. Department of Agriculture, and Dr. Waring, of the California Agricultural Experiment Station.—V. A. N.

REPORT OF ASSISTANT TERRITORIAL VETERINARIAN.

Honolulu, Oct. 1, 1915.

Dr. V. A. Nørgaard,
Chief, Division of Animal Industry.

Sir:—I have the honor to submit the following report for September, 1915:

Tuberculosis Control.

The following dairy cattle were tested during the past month:

Name	Total	Passed	Condemned
Geo. Holt.....	31	22	9
Waialae Ranch.....	391	376	15
S. I. Shaw.....	2	2	0
Victorius Souza.....	4	4	0
Waialae Ranch.....	60	57	3
J. A. Templeton.....	88	88	0
Frank Andrade.....	55	52	3
Antone Pires.....	6	6	0
C. K. Quinn.....	6	6	0

A total of 643 head were tested, out of which number 613 were passed and tagged, and 30 condemned and branded. Of these condemned animals 21 have already been slaughtered and the remaining 9 are segregated.

In the case of the cow condemned in A. Pacheco's dairy on July 20, and which had previously been tested and condemned by Dr. H. B. Elliot in Hilo, Dr. Elliot reports that the above cow was stolen from the paddock in which he had segregated it and was sold to one Antone Nobriga, who in turn sold it to A. Pacheco.

Mr. Pacheco had the cow slaughtered at the Waialae slaughterhouse on or about August 14th, and as no report was made to this office no post-mortem examination was made. It was intended to force Mr. Nobriga to refund the purchase price of the cow, but this idea will have to be abandoned as he was killed a few days ago by an auto truck.

Glanders.

Glanders has again made its appearance in Honolulu after a lapse of nearly four years.

A horse showing suspicious symptoms was discovered at the Abraham Fernandez place in Kalihi and reported to the office by Dr. W. T. Monsarrat. An investigation revealed the following:

Two horses on the place, one in good condition and apparently healthy, the other in very poor condition being practically skin and bones and very weak. This animal presented the following symptoms: An oily sticky, bilateral, nasal discharge; both sub-maxillary glands swollen and firmly adherent to the jaw-bones and an occasional cough. The animal walked with a stiffened gait, with head hanging low, but seemed to have a ravenous appetite.

Each horse received an intradermal injection of four drops of Malleins at 11:00 a. m. An examination at 4:00 p. m. showed swellings 2 inches in diameter at the point of inoculation in each case. On the horse showing clinical symptoms no sensitiveness was apparent, but the swelling on the other horse was quite painful.

A further examination was made the following day and there was no apparent reaction to the intradermal test in the clinical case the swelling being the same size and without heat or tenderness. In the other horse, however, a swelling appeared which was 4 inches in diameter and extremely painful. From its lower edge, two corded lymphatics extended for an inch toward the point of the shoulder.

At 11:00 a. m. each horse was given one drop of ophthalmic malleins in the left eye and the clinical case ordered to the quarantine station where it was taken on a dray. It was in a moribund condition when it reached the station and fell from the dray as the corral was reached. At this time there was considerable muco-purulent discharge from the left eye—four and one-half hours after instillation of ophthalmic malleins.

The horse was killed where it lay and a post-mortem examination revealed the following:

The nasal septum, turbinated bones and superior maxillary sinuses were covered with ulcers and purulent discharge. In places the nasal septum was nearly eaten through. The lungs showed four adhesions to the costal plura and all the lobes were filled with shot-like nodules. All the other organs of the body were apparently normal.

An examination of the remaining horse on the following day, 24 hours after instillation of ophthalmic malleins, revealed a very pronounced reaction. The reaction to the intradermal test was considerably intensified, the swelling now being 6 inches in diameter, very painful and with three corded lymphatics extending to the point of the shoulder. The animal presented a very depressed appearance, standing in one place practically all the time with head hanging and caring little for food of any kind. The horse was removed to the quarantine station and directions were given for a complete and thorough disinfection of the premises.

A few days later this animal was killed and on post-mortem examination both lungs were found to contain shot-like glanders

nodules. The general character of these nodules indicated a comparatively recent infection. No other lesions were found in the body, the nasal septum and turbinated bones were perfectly clean and no scars were present.

This is not the first time that glanders has appeared on the Fernandez place. In November, 1910, a horse was taken from there to the quarantine station, tested and condemned, post-mortem examination verifying the test. This all goes to show the length of time an animal, especially the horse, will carry the disease germs in his system and still remain apparently healthy. Not until the vitality of the system has been lowered through the operation of one or more of the various causes such as lack of food, poor food, harsh treatment, over work, etc., will the invading organisms be able to overcome the defensive forces of the body, commence to multiply and to produce lesions of disease.

In the lungs of one of these two cases, the one showing clinical symptoms, calcareous and encapsulated nodules were found which, until further knowledge of the subject, must be regarded as primary lesions and indicating an infection of some duration and further indicative that this animal was the carrier of the infection. Still I am of the opinion that other things besides age inter into the calcification and encapsulation of diseased areas in both glanders and tuberculosis. These two conditions may not always indicate a primary lesion and it is very difficult, not to say impossible to point out the original point of infection as calcification, particularly, may take place more rapidly in one part of the body than in another and a secondary lesion assume all the indications of a primary focus.

Hog Cholera.

Several inspections were made during the month, both at Pond's piggery, below Schofield Barracks, and at Bellina's piggery at Kuliouou. Considerable improvement has taken place in both places. No loss in either young or old hogs is occurring at Mr. Bellina's ranch, and it is safe to say that no further loss will take place as long as the present system of serum inoculation is adhered to. At Mr. Pond's farm little loss is occurring, and what there is cannot, at this time, be attributed directly to hog cholera. A certain percentage of loss among the young must be expected in the first litters following the injection of heavy sows with serum. The losses among the older hogs has been due to various digestive troubles consequent on forced swill feeding. Better management is working toward improvement, larger and stronger litters are being farrowed and all young pigs receive serum inoculations, both before and at the time of weaning. This is the most practical method to follow, it costs less and the pigs of this age are much easier to handle. Carried out

in this manner the great value of anti-hog cholera serum in the control of this disease can be fully demonstrated.

During the latter part of August and this past month, three shipments of hogs totaling 63 head have come from the Pond farm for the Honolulu market. Post-mortem examination at the slaughter house has not revealed the slightest evidence of cholera.

Importations of Live Stock.

S. S. Kentuckian, Seattle: 1 dog, Wells, Fargo Exp.

S. S. Ventura, San Francisco: 1 dog, William Knight.

S. S. Manoa, San Francisco: 8 crates poultry.

S. S. Matsonia, San Francisco: 2 dogs, Wells, Fargo Exp.; 1 dog, Mrs. F. Kunewa; 1 ct. rabbits, Mrs. H. Sanberg; 6 cts. poultry.

S. S. Niagara, Sydney: 1 dog, Dr. N. A. Neeley.

S. S. Lurline, San Francisco: 24 mules, Schuman Carriage Co.; 3 Holstein cows, 1 calf, S. I. Shaw; 1 Ayrshire bull, 2 Jersey cows, 2 Ayrshire cows, 6 Ayrshire calves, W. H. Rice, Kauai; 1 horse, Lt. G. H. Smith. For Kahului—19 brood mares, 1 registered percheron mare, 1 registered percheron stallion, 2 horses (standard bred), 4 horses (thoroughbred), Maui Agricultural Co.

S. S. China, Orient: 1 cat, Mr. Irwin.

S. S. Texas, Seattle: 16 horses, 13 mules, 6 sheep, 5 cows, A. L. Macpherson; 300 hogs, P. M. Pond; 140 hogs, C. Q. Yee Hop.

S. S. Wilhelmina, San Francisco: 11 cs. poultry; 1 dog, J. S. Wright; 2 dogs, E. G. Norita.

The black toy Pomeranian, which Mrs. J. D. Spreckels brought with her from San Francisco on July 16, and which has been in quarantine ever since, was suddenly taken sick on the morning of September 16 and died at noon. As I was at Mr. Templeton's dairy, Wahiawa, Dr. L. E. Case was called in attendance and a full report of the symptoms and post-mortem findings is herewith appended.

Respectfully submitted,

LEONARD N. CASE,
Asst. Territorial Veterinarian.

Honolulu, October 29, 1915.

Dr. Leonard N. Case,
Assistant Territorial Veterinarian.

Sir:—I beg to submit the following report:

On the 16th of September, 1915, I was called to the Animal Quarantine Station to attend a dog—Toy Pomeranian—the property of Mrs. J. D. Spreckels. Upon arrival I found the animal

dead. The following history of the case was given me by the attendant:

Subject seemed perfectly well up to evening of the 15th, at which time its appetite was noticed to be poor. The following morning he was a little more dull and the stool of a liquid sanguinous material.

Post-mortem examination showed the following conditions:

Organs of the pleural cavity normal in appearance and consistency. In the abdominal cavity the stomach, spleen and liver were normal; small intestines, caecum and a small portion of the large intestines were normal to all appearances; the remaining portions of the intestinal tract presented a dark red color and when opened were found to contain a large quantity of a glassy sanguinous material. The mucous membrane was greatly thickened and inflamed.

The right kidney was normal in size and consistency, the left was greatly atrophied, being about one-sixth its normal size.

Conclusion: Death was due to an acute hemorrhagic enteritis.

Respectfully submitted,

L. E. CASE,
Veterinarian, Quar. Dept., U. S. A.

DIVISION OF ENTOMOLOGY.

Honolulu, Oct. 27, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the work performed by the Division of Entomology for the month of September, 1915, as follows:

During the month 56 vessels arrived at the port of Honolulu, of which 20 carried vegetable matter and one vessel brought sand. Of these vessels six passed through the Panama Canal.

<i>Disposal</i>	<i>Lots</i>	<i>Parcels</i>
Passed free from pests.....	1,342	29,557
Fumigated	11	131
Burned	39	40
Returned	1	1
Total inspected	1,393	29,729

Of these shipments 29,491 packages arrived as freight, 110 packages as mail matter and 128 packages as baggage of passengers and immigrants.

Rice, Beans and Cereals.

During the month 23,679 bags of rice, 2062 bags of beans and 20 bags of corn arrived from Oriental ports. Sixty-five bays of beans were found to be infected and after fumigation were allowed to enter the Territory.

Pests Intercepted.

Twenty-one packages of fruit and 9 packages of vegetables were confiscated from the baggage of passengers and immigrants from foreign countries and destroyed by burning.

A small package of seeds from Guam contained the following pests: A few Lepidopterous larvae, scale insects on nipa nuts, mango seeds containing *Nitidulid* beetles and some Anthribid beetles in other seeds. This shipment was thoroughly fumigated and the mango seeds were destroyed by burning.

Sixty-five bags of beans from Japan were infested with the bean moth (*Paralipsa modesta*). The shipment was thoroughly treated with carbon bisulphide before delivery.

A shipment of orchids from Manila was treated to fumigation on account of being infested with ants.

A package of acacia seeds from San Francisco was found weevily and was fumigated.

A shipment of four small plants in baggage from Japan was held until the soil around the roots was removed.

One package of betel nuts from Manila by mail was returned to shipper under the ruling of the Federal Horticultural Board.

BENEFICIAL INSECTS.

The breeding and distribution of the various parasites of the fruitfly and the various dungflies has been continued on a small scale. During the month of September the following parasites were reared:

<i>Tetrastichus giffardii</i>	12,100
<i>Diachasma fullawayi</i>	789
<i>Diachasma tryoni</i>	379

Total reared 13,268

The usual amount of breeding of parasites of the various dungflies has continued and the following parasites, including those of the fruitflies were liberated in various sections:

Tetrastichus giffardii.....	9,000
Diachasma fullawayi.....	804
Diachasma tryoni.....	370
African spalangia.....	3,100
Philippine spalangia.....	3,100
African hornfly.....	500
Philippine pteromalid.....	500
Dirhinus giffardii.....	150
Galosus silvestrii.....	250

Total distributed: 17,774

Besides the above species, large numbers of *Opius humilis* were liberated. These are constantly reared from fruits used in the insectary and this shown that the species is well established here.

From the colonies of Mealy bug (*Leptomastix histrio* ?) brought from California last month, I was able to liberate 300 individuals. Another consignment of this parasite will shortly arrive from the California State Insectary.

Several lots of inoculated Japanese beetles have been distributed on this and other islands.

Hilo Inspection.

During the month of September Brother Matthias Newell reports the arrival of six steamers and one sailing vessel, of which four steamers brought vegetable matter consisting of 350 lots and 4495 packages, all of which was passed as being free from pests and disease.

Inter Island Inspection.

During the month 66 steamers plying between Honolulu and the other islands were attended to. The following shipments were passed:

Taro	491	bags
Plants	164	packages
Fruit	28	"
Vegetables	39	"

Total inspected 722 "

The following packages were refused shipment on account of infestation or of having soil attached to the plants:

Plants	14	packages
Fruit	32	"
Vegetables	1	"
	<hr/>	
Total refused	47	"
	<hr/>	

Respectfully submitted,

E. M. EHRHORN,
Superintendent of Entomology.

DIVISION OF FORESTRY.

Honolulu, Oct. 15, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit the following routine report for the Division of Forestry for the month of September, 1915:

Forest Fires.

Three grass fires occurred during the early part of the month in the region of Lihue on the eastern slope of the Waianae Mountains, Oahu, but only one of them did any damage, a small amount, to tree growth. The first occurred on September 5 and was extinguished the same day. The second, on September 6 and was put out the following day only after a fire line had been dug around it. The third, at which I was present, started at noon on September 8 and was extinguished within 40 minutes. The second fire burned over several acres on the higher slopes while the other two, which occurred only in grass and lantana, burned over a few acres. The dry conditions made it possible for the fires to burn very readily and unfortunately the originator of none of them was apprehended. They were all on private lands and were extinguished by laborers working in the adjacent pineapple fields of the Hawaii Preserving Company, who had strict orders promptly to leave their work and rush to every fire at the first sign of smoke. Foreman A. McAngus and Time-keeper Claude Bailey of the above company deserve great credit for the prompt and efficient manner in which they supervised the extinguishment of these fires. The copious rains which began on September 20 removed any further fire danger.

The continued dry conditions in North Kohala, Hawaii, and the occurrence of an extensive grass fire in that region, mentioned in my August report, made it seem advisable, on the recommendation of District Fire Warden S. F. Woods, to require permits for burning brush for a period. A notice to this effect was accordingly published in "The Kohala Midget" on September 22.

This requirement applies to the land in North Kohala from the northern boundary of the land of Kawaihae 1 to and including the land of Kaauhuhu and runs until November 30, 1915.

Water Investigation.

In company with the Superintendent of Hydrography, on September 14, I visited the mountain region in the vicinity of the Waiahole tunnel and made observations which will have some bearing on the possible effect on the native forest of the rapid withdrawal of underground waters. Memoranda were prepared on this subject by Mr. Larrison and myself for the President to transmit to the Governor, who is interested in the question.

Forest Reserve Inspection.

On September 16, in company with the Forest Nurseryman, I inspected the 132 acres of private land in the Honolulu Watershed Forest Reserve in Manoa Valley which, under an agreement dated June 13, 1914, were turned over to the care and control of the Board for 5 years by Hon. Geo. R. Carter. The eucalyptus and other trees already planted are doing well and directions were given the caretaker concerning further planting.

Sales of Awa Root.

Under authority granted by the Board on September 21, a sale of two tons of mature awa root in the Puna Forest Reserve, Hawaii, was made to Mr. C. M. Hudson of Hilo. Under a formal agreement approved on September 25, Mr. Hudson undertakes to plant 18 awa slips for every plant removed, to use every precaution to prevent forest fires and other damage to forest growth, and to remove the awa within 60 days. The payment of \$100 for the awa, which has been made, goes into the special fund which may be expended on forest reserves.

A notice calling for bids on an unestimated amount of awa root to be gathered in the Hamakua Pali Forest Reserve, Hawaii, has been published in the "Hawaii Herald." Bids will be received until October 16 and the awa will be allowed to be gathered only under conditions similar to those stated above. The sale of this awa at the present time is made with the Board's approval only so that available mature awa may be obtained to help out the Puna homesteaders in holding the present market until their planted awa is ready for harvesting and does not necessarily establish a policy of selling awa root generally from the forest reserves.

Forest Fencing.

Extensive work on the forest reserve boundary fence at Anahola, Kauai, began on September 27, when two laborers began to assist Forest Ranger Lovell in the digging of fence post holes.

Bids are being advertised for the construction of the fence around the koa grove in the Olaa Forest Park Reserve at 29 miles on the Volcano Road, Hawaii, and will be received at this office up to and including October 20.

Coöperation With H. S. P. A.

At the request of Hon. L. A. Thurston, chairman of the Committee on Forestry of the Hawaiian Sugar Planters' Association, I prepared and submitted to him material for the next annual meeting of the association on the relation of the sugar plantations to progress made during the last year in forest protection and extension and pointed out some salient needs and what yet remains to be done.

Arbor Day.

Attention is once more called to Arbor Day, which will be celebrated by tree planting some time about the middle of November, and for which our nurseries are getting ready a supply of suitable trees.

Respectfully submitted,

C. S. JUDD,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, Oct. 15, 1915.

Superintendent of Forestry.

Dear Sir:—The following report gives the principal work done during the month of September:

Nursery.

Distribution of Plants.

	In seed boxes	In boxes transplanted	Pot grown	Total
Sold	600	72	672
Gratis	230	930	1160
	830	1002	1832

Collections.

Government Realizations:

Collections on account of plants sold amounted to.....\$ 7.15

Preservation Forest Reserves:

Sale of 2 tons of Awa Root in Puna Forest Reserve, Hawaii, under permit approved Sept. 25, 1915..... 100.00

Rent of premises at Half Way House, Tantalus, for July, August and September..... 30.00

For use of two acres of land Pauoa Valley, for July, August and September..... 5.00

For use of land and gathering ti leaf, on Kalawahine, Pauoa Valley, July, August and September..... 12.50

\$147.50

Plantation Companies and Other Corporations.

Under this heading 38,000 trees in seed boxes were distributed. From present indications, it would seem that a great deal of tree planting will be undertaken during the coming rainy season. Many inquiries are being received in regard to trees for wind breaks, firewood and other purposes.

Collection and Distribution of Seed.

From the Board of Trustees, Pukekura Park, New Plymouth, New Zealand, we received a letter of thanks for a collection of seed which we gave to Mr. Tribe, a member of the Park Trustees when he passed through Honolulu a short time ago. The letter also stated that they were sending us a collection of seed of their native flora.

A request for forest tree seed was received from The Director, Agricultural Station, l'Ivoloina, near Tamatave, Madagascar, from Prof. C. J. Hunn, University of Porto Rico, College of Agriculture, Mayaguez, a full list of sample packets. Seed has been forwarded as requested. At the nursery we have had several requests for seed samples from tourists and others passing through Honolulu. Those we gave sample packets with the understanding that they send us seed in return. The seed boys have been kept busy collecting seed in and around the city and on Tantalus.

Makiki Station.

At this station the greater part of the trees to be used during the coming planting season are kept. Caring for these, also transplanting, sterilizing and mixing soil, has constituted the principal work done during the month.

Honolulu Water Shed Planting.

The number of trees planted out during September amounted to 702 kukui. Other work done consisted of making holes and hoeing the young trees recently planted.

Advice and Assistance.

The writer has made calls and otherwise given advice and assistance at the request of people residing in the neighborhood of Honolulu, and on the other islands as follows:

Calls in and around the city.....	10
Advice by telephone	12
Advice to people calling at nursery.....	9
By letter to other islands.....	6
	<hr/> 37

Respectfully submitted,

DAVID HAUGHS,
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

Honolulu, October 14, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the Division of Hydrography during September, 1915, is submitted:

Special Investigations.

The Governor of Hawaii has on several occasions called on this office for data and advice relative to water resources of the Territory. Special reports relative to water resources in the vicinity of Honolulu and Kapaa, Kauai, have been furnished. Copies of these reports are appended hereto.

Weather Conditions.

The dry weather conditions were broken by general rains beginning on Oahu and the most of Kauai about the middle of the month. Generous rains began on Maui, southern Hawaii and in the Lihue and Koloa districts of Kauai about the 20th, and all islands received rainfall above the average during the latter part of the month.

Data Furnished Honolulu Water Supply Commission.

At the request of the chairman of the commission a considerable amount of data have been furnished the commission. Arrangements have been made whereby data or information, which may be of value to this commission, will be forwarded to it as rapidly as these become available.

1913-1915 Biennial Report.

A biennial report for the biennial period ending June 30, 1915, which will include all data collected by this division during that period, is being prepared and will be available in blue print form by December 31, 1915. It is estimated that this report, which involves an immense amount of computations and office work, is now about 95 per cent. completed.

There has been a much greater demand during the past three months for hydrometric data than ever before, and the office force has been kept busy preparing data for special localities in order that these may be used in the near future.

Requests have been received for data relative to the streams and ditches of the districts of Laie, Punaluu, Heeia, Kaneohe, Kahanaiki, Kailua, Makawao, and all streams in the vicinity of Honolulu on Oahu; for the Waihee, Waiehu, Iao, and Waikapu districts on West Maui and all waters on East Maui; for the Anahola, Kapaa, North and South Wailua districts on Kauai; and for the Wailuku district on Hawaii.

Flood Storage Near Laie, Oahu.

The Laie Plantation is planning the storage of flood waters of the Koloa and Wailele streams. Continuous record stream gauging stations were established on these stream in July, 1914, by this office in coöperation with and at the expense of the plantation. Operation of these stations has uncovered the necessity of the construction of permanent concrete controls in order that the data obtained may be of more accuracy. The plantation is paying for the construction of these controls, which are being constructed by this office. This work has been started and will be completed during the present month.

It is believed that the information supplied by these measurement stations will enable Laie Plantation to supplant its present pumping plants by a gravity water supply system which will supply irrigation at a great saving of cost.

New Construction.

The construction of the three new continuous record stream measurement stations on the three main branches of the Waimea

River on Kauai is progressing favorably. It is estimated that these stations will be completed by October 31, 1915.

A reconnaissance of the upper valleys of the Honokawai, Olowalu and Ukumehame on Maui was made, and locations selected for the new continuous record stream measurement stations to be established on the Olowalu and Ukumehame streams.

Routine Maintenance and Operation Work.

Kauai.—W. V. Hardy, accompanied by R. C. Rice of the Honolulu office, visited 32 stream and ditch measurement stations and made 25 measurements at regular stations and two miscellaneous measurements. One laborer was employed during the entire month improving trails.

Oahu.—Twenty-seven stream and ditch, and four rainfall measurement stations were visited. Sixteen stream and ditch measurements were made. The Waiahole Tunnel outflow was measured, and was found to be decreasing rapidly at both portals. The flow from the north portal on September 6 was 17.7 million gallons daily and on September 30 about 16.7 million gallons daily. On October 2, the flow from the south portal was 9.6 million gallons daily. The total flow from both portals on September 30 was about 26 million gallons daily.

Maui.—Only routine work was done. Twenty-nine stream and ditch, and three rainfall measurement stations were visited. Eight stream measurements were made.

Molokai and Hawaii.—Only rainfall measurements were made by coöperative observers.

October Plans.

Kauai.—New measurement stations on Waimea River will be completed. Four stream and ditch measurement stations on the upper Hanapepe River (privately-owned) will be abandoned. Trail clearing will be continued.

Oahu.—A large amount of maintenance work will be done, such as repairing weirs, foot bridges, etc. New concrete controls will be completed on the Koloa, Waialele, Kahawainui, East and Middle Malackahana near Laie and Kahuku. An investigation of water resources between Diamond Head and Makapuu Point for the military authorities will be started.

Maui.—Only routine maintenance and operation work will be done.

Very respectfully,

G. K. LARRISON,
Superintendent of Hydrography.

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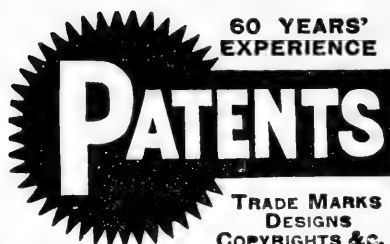
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Board of Agriculture and Forestry

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A complete list of the publications of the Board available for distribution (together with the titles of certain issues now out of print) is to be found on the cover of the last biennial report.

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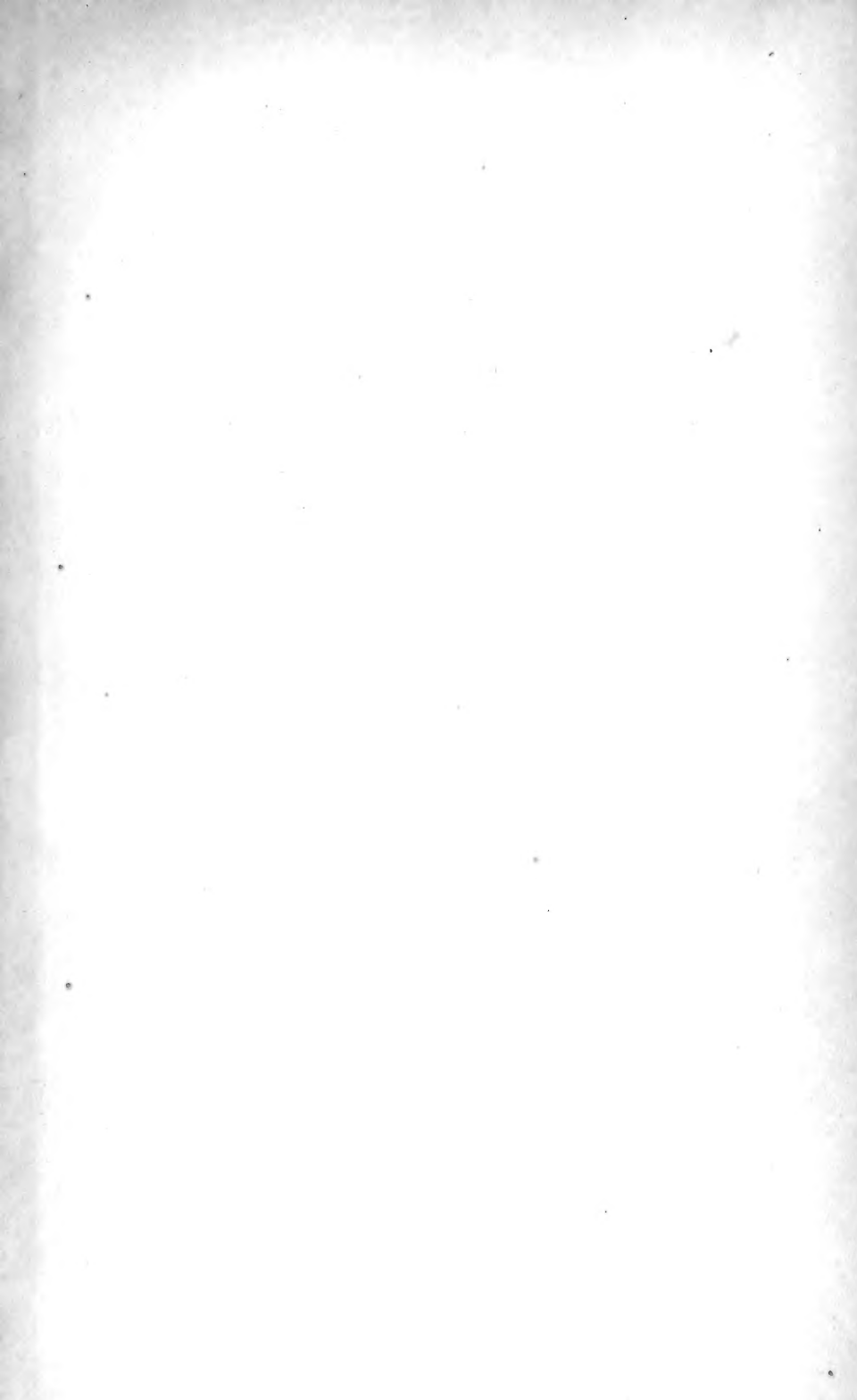
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Rooms 17-22 Kapiolani Bldg. Tel. No. 3662.

The Division of Hydrography has on hand free publications relative to the water resources of the Hawaiian Islands. These publications furnish detailed data as to daily, monthly, mean, maximum, and minimum run-off of streams and ditches, and also cuts and maps pertaining to the different islands. These publications will be mailed free of charge on request.

The records and maps of this division are available for inspection by any one who desires information relative to water resources, topography, etc. Blue print copies of hydrographic data relative to any stream, ditch, spring, etc., which may be under observation by this division will be mailed free of charge on request.

G. K. LARRISON,
Superintendent of Hydrography.



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